University of Alberta

Formal Beef Alliance and Alignment Problems in Canadian Beef Industry

by

Xin Lan ©

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Date: Jan. 08. 2006

Abstract

This thesis develops and analyzes a survey to examine beef producer's attitudes towards strategic alliances and a set of marketing contracts. The data for this study were collected from a sample of beef producers in western Canada through a 2006 web-based and on-site survey. Two binary logit models are estimated. In the beef alliance participation model, producer's age, education level and beef cowherd size are found to have a significant impact on the producers' decision to participate in alliances. The conditional logit model based on a set of choice experiments indicates that the marketing and compensation methods (sales type), the information sharing schemes (data sharing) and the size of membership fees significantly affect the choice behavior between different types of alliances. However, the production protocols have no significant impact on producers' choice behavior. The thesis concludes with recommendations on how to improve future design of contracts and beef alliances.

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Chapter 1 Introduction

1.1 Background

With the development of consumer-driven markets and more capital intensive beef production systems, traditional marketing systems of feeder and fed cattle are evolving into more sophisticated, closely coordinated supply chain, where individual animal and cutout pricing becomes increasingly important. According to USDA, the production value in cattle production under contracts grew from 19% in 1994-95 to 29% in 2003[1]. Although more recent Canadian data of beef industry is not available at present, the trend towards closer vertical coordination in the Canadian Agri-food sectors is similar to trends observed in the U.S. (Brocklebank and Hobbs 2004; Hobbs and Young 2001). Previous studies have shown that increasing vertical coordination in the beef industry has emerged primarily due to the increasing needs to ensure that consumer demands are met (Brocklebank and Hobbs 2004). Further, there are two other factors that have led to closer coordinated between beef producers and the rest of the supply chain: (1) the need to reduce costs, and (2) the need for enhanced risk management (Hayenga et al. 2000).

Vertical coordination is a broad concept which includes several strategic options for the supply chain participants. Wysocki et al. (2003) suggest that vertical coordination continuums include simple spot transactions at one end, where products move between stages in a commodity market in response to price signals, to vertical integration at the other end of the spectrum, where entire production stages are owned by one firm. In between lie several transitional coordinating mechanisms, including formal contracts and strategic alliances (i.e., relation-based and equity based) (Brocklebank and Hobbs 2004; Wysocki et al. 2003; Wysocki et al. 2004). Among methods for vertical coordination of beef industry, contracts have been found to be important means to improve coordination in a variety of agriculture industries (MacDonald et al. 2004). The two major types of contracts are marketing contracts and production contracts. These contracts vary in terms of product ownership, management responsibility, and the provision of product inputs. In marketing contracts, producers own the product, manage it, and provide most or all of the production inputs. Therefore, marketing contracts control market access and price risk, but may not address production loss or management risks. Production contracts involve increased processor provision of inputs, product ownership, and participation in management. In exchange, production loss and management risks are reduced for producers (Boland et al. 1999; MacDonald et al. 2004). Over time, the use of marketing and production contract has become more widespread in North America's agricultural sector, with an increased trend towards vertical coordination in the individual product sector. According to USDA (MacDonald et al. 2004), 34.5 percent of agricultural products were marketed through contracts and 8 percent through vertical integration. The use of vertical coordination mechanisms is less widespread in the beef industry, compared to poultry and pork (MacDonald et al. 2004). Marketing contracts in the beef sector are mostly used between processors and feedlots, while their emergence has been less apparent between cow-calf producers and feedlots (Hayenga et al. 2000). On the other hands, cow-calf producers in Western Canada frequently choose to background or retain ownership using custom feeding agreements with feedlot operations. Formal contracts are also used in beef alliances, which link all stages of production, processing and marketing. Links are created between entities that are under separate ownership to help coordinate the efforts of those entities (Brocklebank and Hobbs 2004; Hudson 2001). However, only about 20% of fed cattle are sold under grid pricing and through alliances in Canada, as compared to that of US (i.e., 50%) (Brocklebank and Hobbs 2004; Schroeder 2003).

---

[1] Source: MacDonald and Korb (2006)

In sum, traditional beef production systems and spot market transactions are increasingly enhanced or substituted by tighter measures of supply coordination. Alternative vertical coordination schemes through the use of contracts, informal and formal strategic alliance, or vertical integration reduce vertical segmentations in beef supply chain by linking different production sectors more closely. Increased information sharing scheme allows alliance participants to respond more effectively to changing consumer demands. However, it is worthy emphasizing that while one of the main motivations to improve supply coordination is to reduce the added costs and to distribute the production and price risks more equitably, new costs and risks arise with increasing supply coordination due to the gap between different groups of producers. Thus, the ability of cattle producers to adapt to those alternative marketing and production practices that arise with the vertical coordination will have tremendous impacts on their profits.

1.2 Problem Statement

The movement towards vertical coordination of the beef industry has been limited in cow-calf operations. On the one hand, it may be due to the varying scales of operation that each stage requires to function efficiently. Cow-calf producers operate most efficiently on a relatively small scale as a result of land extensive production and capital extensive vertical coordination, compared with other stages of the supply chain (Bailey 1998; Brocklebank and Hobbs 2004; Schroeder 2003). On the other hand, cow-calf operations operate at the bottom stage of supply chain, and often lack sufficient incentives to participate in the process of vertical coordination with upper stream producers in current beef industry due to problems of asymmetric information and inappropriate design of coordination schemes.

The most recent study on the Canadian beef sector has analyzed supply-chain coordination issues from the perspective of transaction costs (Brocklebank and Hobbs 2004). A key finding of this study is that, on average, cow-calf producers have a preference for a combination of live weight and carcass quality pricing, even though using this pricing method means that they incur some of the risk associated with variability in cattle quality. This result suggests that an analysis of incentive and risk-management issues as part of more formal coordination schemes in the beef industry is highly desirable. Further, Brocklebank and Hobbs (2004) found that, overall, the risk of opportunistic behavior as a result of investment in specific assets is minimal, and has not had a great impact on the degree of supply chain coordination (Brocklebank and Hobbs 2004). This important result has been derived due to the authors' analytical focus on the transaction cost framework of Williamson (1985). However, if we are interested in analyzing incentive and performance issues in supply coordination mechanisms, it is desirable to broaden the analytical view. Rather than focusing on the issues of relation-specific investment and the related hold-up problem, which is largely the transactions cost perspective, it is desirable to take a broader agency and organizational view of more formal coordination mechanisms in the beef supply chain. Therefore, issues that relate to the incentive implications of pricing schemes (Steiner 2007) and issues of data sharing between members of beef supply chains are also of interest.

1.3 Study Objectives

This study focuses on formal marketing alliances between cow-calf producers, backgrounders and feedlots, and asks to what extent there are incentive and organizational issues related to profit sharing, data exchange and risk management, such that supply chain coordination may be improved. These issues are primarily explored at the level of cow-calf producers in four individual provinces, namely Alberta, Manitoba, Saskatchewan and British Columbia. More specifically, the objectives are:

(1) To review current marketing and production practices adopted by cow-calf producers; and

(2) To review vertical coordination schemes in the North American beef industry, focusing on studies of beef strategic alliances ;

(3) To analyze producers' currently used risk-management and coordination mechanisms; and

(4) To analyze cow-calf producers' attitudes towards different strategic beef alliances through survey methods; and

(5) To use the survey results in order to provide recommendations for improved supply-chain alignment.

1.4 Hypothesis

Throughout this thesis, several hypotheses will be explored:

(1) Producers are differentiated in more coordinated beef supply chains. Their characteristics and demographics, such as beef cowherd size, education, experiences, and age are hypothesized to have a significant impact on their decision to adopt alternative marketing arrangements such as beef alliances. More specifically, it is hypothesized that education and beef cowherd size are positively related to the probability of participating in a beef alliance, while age of producers are negatively related to their participation decision.

(2) Producers have different incentives to adopt a specific organizational structure. Their choice behavior can not only be explained by the transaction cost perspective (i.e., minimizing the transaction costs), but also by agency theory and property rights theory. Therefore, attributes of alternative marketing arrangement, such as the terms of contracts are hypothesized to have significant impacts on producers' choice behavior. A well-designed information sharing system, a compensation scheme (profits sharing), and relationship-specificity investments (e.g., production protocols) would be necessary to design an effective beef alliances.

1.5 Thesis Organization

Following chapter 1, Chapter **2** provides an overview of the Canadian beef industry. By comparing the traditional beef supply chain and more vertically coordinated value chains, a general conceptual framework of strategic beef alliances will be developed. Chapter **3** reviews the different theoretical foundations of vertical coordination, as they relate to the choice and efficiency of contracts and associated pricing schemes. The chapter briefly reviews transaction cost theory, agency theory, incomplete contract and property rights theory. Chapter **4** describes the research methodology used in this study. A random utility framework will be developed as it is relevant for the discrete choice models which will be used in this study. Based on the analysis of different beef alliance, this paper utilizes an attribute-based choice experiment to examine cow-calf producer preferences for a set of marketing contracts as part of beef alliances. Sales type, information sharing scheme, production protocol sharing and other contract specifications are being explored as possible drivers for alliance participation and supply chain coordination. The chapter also discusses the design and implementation of the farm-level survey among cow-calf producers. Chapter **5** discusses the model specification, econometric estimation procedure, empirical results and policy implications. Chapter **6** provides a summary and discusses implications for cow-calf producers and supply-chain alignment.

Chapter 2 Industry Background

2.1 Introduction

The purpose of this chapter is to provide an overview of the beef industry's participants, structure, products and current beef consumption trends. Some important issues associated with the cow-calf producers, feeders (i.e. feedlots) and packers in the traditional beef industry will be discussed in this section. This chapter also examines the alignment problems associated with the vertical coordination of the beef industry, focusing specifically on the reasons behind the emergence of contractual arrangements and beef strategic alliances.

2.2 Canadian Cattle and Beef Industry Overview

While contributing to a safe and nutritious food supply, beef production in Canada also adds significantly to the national and provincial economies. According to Statistics Canada (2005), Canada's beef industry is the largest single commodity source of farm cash receipts. Farm cash receipts from the sale of cattle and calves in 2005 totaled $6.4 billion or about 17.34 per cent of total farm cash receipts. In addition, beef production contributes to the processing, retail, food service and international trade sectors. In 2005, Canada produced 3.5 billion pounds of beef (i.e., 1.6 billion kilograms carcass weight) and the beef production added about $25 billion to Canada's economy. In 2005, Canada exported about 45% of total beef and cattle produced in Canada. This was an increase of 10% over 2004, and has made Canada the third largest beef exporting country (CanFax 2006).

The most recent Statistics Canada inventory report shows that there are 14.8 million head of cattle in Canada at the end of Jan, 2006 (CanFax 2006). That inventory is divided into beef cows, dairy cows, bulls, feeder steers and heifers (dairy, breeding and slaughter) and calves. Of the inventory, about 43% are cows while 57% are steers and heifers. **Table 2.01** shows the Statistics Canada Jan, 2006 inventory tabulations for dedicated beef cow-calf and feeding operations.

As can be seen from the **Table 2.01**, the beef industry is largely western based. It presents a distribution that the raising of beef cattle is concentrated in western Canada, away from the main consumption centers (i.e., Ontario and Québec) of the country. Alberta is by far the largest beef production province, followed by Ontario, Saskatchewan, Manitoba, and British Columbia. In 2005, Alberta accounted for 69% of Canadian fed cattle production while Saskatchewan, Manitoba and British Columbia account for 9.4% of the country's fed cattle production (**Figure 2.01**).

Over 40% of Canada's beef cows are in Alberta while the three Prairie Provinces account for over 80% of the country's beef cowherd. In addition, the three Prairie Provinces account for over three quarters of the country's cattle on feed inventory. The modest disparity between the western cowherd and the western feeding share is explained by the fact that Ontario still feeds a significant volume of western cattle. This geographic distribution is formed principally for climatic conditions (Steckle 2004). Among three Prairie Provinces, Alberta's cattle industry has experienced steady growth since 1986, reaching a peak of almost 2.1 million beef cows and replacement heifer inventories in 1995, before falling off slightly. From then on, the province is holding steady at about 40 percent of total Canadian beef cow herd. Much of this growth paralleled the sizeable investments made in local cattle feeding industry and beef processing facilities in Alberta. On a per farm basis, the average total investment in Alberta beef operation has risen by 45.3%, from $602.0 thousand to $874.6 thousand per farm, over the 12 year period ending in 1999 (Alberta Agriculture 2001).

With regard to the packing industry, about 72% of the total Canadian cattle slaughter occurred in the west and 63% was in Alberta alone in 2005 (Statistics Canada 2005). Over time, the ability to process beef has become more concentrated in the hands of larger, technologically and financially advanced beef processors. Canada's two largest beef processors combined have a capacity to process more than 57,000 head of cattle per week. These are located in the province of Alberta.[2] In 2005, approximately 2.5 million cattle were processed in Alberta. With regard to slaughter breakdown, the west accounted for nearly 79% of steer and heifer slaughter with Alberta alone accounting for 76%. Cow slaughter is more evenly distributed between Eastern and Western Canada. Quebec slaughters about 31% of the cows in the country while Alberta handles 46%. The composition of the slaughter between east and west reflects the geographic distribution of dairy versus beef cows.

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[2] **Cargill Meat Solutions (i.e., weekly slaughter capacity 29,000 head) and Lakeside Packers LTD (i.e.,**

2.3 Traditional Beef Supply Chain

Canada's cattle and beef industry can be divided into three main stages: cow-calf, finishing (feedlot) and packing (processor). However, since backgrounding has been used more significantly by the Canadian beef producers in recent years, the entire beef supply chain could be described of consisting of four major stages (Steckle 2004). **Figure 2.02** presents a flow chart of the traditional beef supply chain in terms of marketing flow and product flow. As Steckle (2004) suggests, the basic functions of four stages of beef production are as follows:

***1. Cow-calf or ranching operations*:** The cow-calf operation is the first stage that produces calves for beef production. Cows are typically selected based on their mothering ability, beef quality traits and other traits and then mated in early summer, to be calved in the next spring (Steckle 2004). When the calf reaches about 227-272 kilograms in open pasture (i.e., except for winter), they are weaned from their mothers and sold to either feedlots/ backgrounding operations, or retained on the farm/ranch.

***2. Backgrounding*:** Backgrounding is defined as growing, feeding and managing steers and heifers from weaning until they are ready for a high concentrated finishing ration (Saskatchewan Agriculture and Food 2000). Backgrounding is a key industry link between the cow-calf industry (producing weaned calves) and the finishing industry (producing slaughter cattle).

***3. Feedlot Operations*:** Feedlot operators purchase cattle (e.g., weaned calves) from cow-calf or backgrounding operators. Feedlots typically put their calves on a high concentrated finishing ration (i.e., a diet consisting of forages or grains) from 272-363

---

weekly slaughter capacity 28,200 head)

kilograms initially, until they reach 544 to 635 kilograms and are ready for slaughter (Steckle 2004).

***4. Packing and Processing Operations*:** The live weight of cattle slaughtered for meat production varies from about 249 to 590 kilograms, depending on the age and breed of the animal. Slaughter cattle are sold by feedlots or ranchers to packing plants. The beef product after processing is cut, trimmed and packaged (Steckle 2004). Packing plants in turn sell these beef products either domestically or internationally to retail and foodservice distributors.

As shown in preceding sections, the traditional beef production and marketing system is characterized by separate production stages. In this setting, the only information exchanged between participants is the sale price of cattle between consecutive stages of production (Hudson 2001). The traditional pricing system in the cattle industry is a so-called live weight pricing system, where buyers either bid on a pen of cattle (i.e., auction), or by direct one-on-one negotiation (i.e., private treaty). In these cases, only two stages of the production sectors participate in transaction in auction market, and thus all economic signals are sent through the price paid for cattle (Hudson 2001). **Figure 2.02** & **2.03** shows the transactions and information exchange (i.e., pricing signal transmission) occurring between participants in the traditional beef industry.

2.4 Changing Structure of the Beef Value Chain

A key change in the beef industry's structure in North America is that the ability to process beef is becoming more concentrated in the hands of larger, technologically and financially advanced beef processors. In the early 1980's, the four largest firms of U.S. slaughtered nearly 33% of the cattle. By 1990, the four largest firms slaughtered 70% of all steers and heifers sent to market. In 1998, this market share has increased to more than 80% (Brocklebank and Hobbs 2004). Cattle's feeding also has become more concentrated. Further, in 2005, there were 196 cattle feeding operators in Alberta who controlled 2.44 million heads of cattle while there were 229 operators who fed 0.93 million heads of cattle in 1991. Meanwhile, among these feeding operators, 35 operators controlled 58% cattle production in Alberta in 2005 (CanFax 2006).

Increased concentration and consolidation in the beef industry of North America has resulted from shifts in consumer demand, advances of technology, information exchange management, and efforts of producers to reduce either production or transaction costs (Brocklebank and Hobbs 2004; Hayenga et al. 2000; Hobbs 1996, 1997). Technology changes and economies of size played a key role in generating cost saving. Marsh and Brester (2003) have shown that technology developments in beef production vary in type and scope. For example, in the cow-calf sector, production protocols that specify the breeding genetics, animal health and nutrition, and other management practices would increase calf-crop percentages, calf weaning weights, and dressed weights of steers and heifers. In the finishing sector, technology changes such as increased capital intensity and economic information system will ensure slaughter weights consistent with quality and yield grades desired by beef processors (Marsh and Brester 2003). Researchers also found that the adoption of new capital equipment, processing and handling methods, and evolving infrastructure and information systems are the major technology advances in beef packing sector (Marsh and Brester 2003). In general, adoption of these technologies requires high levels of capital investment, potentially creating barriers to market entry. Smaller high-cost plants have gradually exited from the industry because they are unlikely to compete with larger plants that have a lower per-unit cost (Brocklebank and Hobbs 2004).

Further, the concentration in the feeding and processing sector of beef industry in both the United States and Canada has been a result of shifts in consumer demand. According to Statistics Canada's **CANSIM** database[3], Canadian per capita consumption of beef has declined significantly over the past twenty years, averaging between 38 and 39 kg per year in the early 1980's and between 29 and 30 kg per year in the last couple of years **(Figure2.04)**. From a peak annual consumption of around 50 kilograms per person in

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[3] **CANSIM** (Canadian Socio-economic Information Management System), is Statistics Canada's computerized data base and information retrieval service.

1975, Canadian consumers now purchase only slightly more than twenty kilograms per capita. The traditional view of determinants of consumers' demand of beef focused on the relative price and consumer disposable income (Schroeder et al. 2000). However, more non-price factors such as health concerns and food safety concerns impact the structure of the supply chain of beef industry. For example, Kinnucan et al. (1997) found that beef demand was negatively affected by health information. Their results indicate that consumers have reduced beef consumption as additional information on cholesterol has been discovered and become publicly available. Also, safety food concerns have been a major factor impacting beef consumption (Schroeder et al. 2000). The beef industry in North America and Europe has experienced a variety of food safety problems in recent years, including Bovine Spongiform Encephalopathy (BSE), Escherichia Coli (E.Coli). In addition, consumer preferences for beef attributes(e.g., tenderness) have also changed significantly over time due to numerous demographic factors, including aging population, increased female and teenager labor force participation (Schroeder and Mark 1999). For example, Blaylock and Smallwood (1986) found that older people tend to consume more poultry and less beef. In addition, the increase in women's participation in labor markets and increased teenage labor has led to increased household income, increased demand for more convenient food products and more meals consumed away from home (Kinsey 1983; Schroeder and Mark 1999).

All these non-price factors that led to changing consumption trends of beef products indicate that consumers have become more demanding when it comes to food safety, consistency, and palatability of the beef that they consume (Schroeder and Mark 1999). The changing consumer demand has resulted in a rearrangement of the structure of the beef industry since the traditional beef industry has failed to transmit consumer demand information effectively to producers in the form of price signals (Schroeder et al. 1998). Most of this problem originates from lack of incentives and information regarding beef quality attributes, and the resulting lack of adequate price signals linked to beef quality. For example, when fed cattle are sold to packers on live weight pricing system without regard for quality, the pricing system does not send economic signals of what consumers demand. To solve these problems, researchers have suggested to promote a more integrated system whereby producers, packers, processors, and retailers ensure product safety and quality (Schroeder and Mark 1999). Within this framework, beef producers adopt several practices that are associated with different organizational structures of the industry. These structures include 1) value-based pricing scheme; 2) contractual arrangements (Schroeder et al. 1998; Schroeder and Kovanada 2003; Ward 2001).

1. Value-based Pricing System

Traditional live cattle pricing scheme for fed cattle marketing has been inadequate at sending appropriate pricing signals to producers regarding cattle quality attributes (Schroeder et al. 1998). The authors suggest that a considerable amount of coordination problems resulted from poor information transmission between cattle feeders and beef packers. They argue that live-weight average pricing of fed cattle inhibits information flow from beef consumers to cattle producers. This poor information flow is one reason for poor beef quality, which has contributed to declining beef demand by nearly 50 percent between 1980 to 1998 (Purcell 1998). Improved pricing systems, popularly referred to as grid pricing or value-based pricing, have developed over recent years, paying premiums and discounts for fed-cattle carcasses based on quality and yield grade of carcass. Schroder and Graff (2000) estimated the pricing error for carcasses of varying quality averaged $30/animal for cattle priced on an average live or dressed weight basis relative to those priced on quality and yield grade values. This indicates a significant value of improved information flow and associated management changes.

2. Contractual Arrangements

Formal contractual arrangements that outline the terms and conditions of transaction have become more widely used in recent years in the beef and cattle industry (MacDonald et al. 2004). Parties in a contract can establish coordination through the ex ante negotiation of contract specifications and incentives for meeting those specifications. Ex post, parties can exert control through monitoring the contract as it is carried out, to ensure that all parties perform as stipulated. A third party is used for enforcement to penalize any parties that violate the agreement (Peterson et al. 1998). There are two primary categories of contracts (MacDonald et al. 2004):

(1). Marketing Contracts: The producer provides a quantity of commodities with specified attributes (i.e., physical/chemical or using a specified set of practices). Pricing may be set before production, or it may be established from a commodity market (i.e., futures or local cash) with a premium/discount. In the agri-food industry, market contracts include forward, basis, call, and minimum price contracts (Hudson 2000).

(2). Production Contracts or Fee for Service Contract: There are two main categories of production contracts available to producers: resource providing contracts and production management contracts (Hudson 2000). In general, both two categories legally specify farmer and contractor responsibilities for production inputs and practices, as well as a mechanism of transaction. For example, under standard livestock production contracts (custom feeding agreement) between cow-calf and feedlots operators, the feedlots operator provides labor and equipment while the cow-calf producer provides feed, veterinary services, and calves. In contrast to resource providing contracts, production management contracts are some combination of both marketing and resource providing contracts based on input specifications (Hudson 2000).

In the cattle industry, contracts have typically been used between packers and feedlots (Brocklebank and Hobbs 2004). Packers primarily use contracts with feedlots to obtain higher quality cattle and more consistent quality cattle (Lawrence et al. 2001). Another motivation for the use of contracts by packers is to reduce operation costs. This cost saving can be realized via developing closer relationships with the producers in the next production stages (i.e., feedlots). For example, Hayenga et al. (2000) indicated that increasing plant utilization from 70 percent to 90 percent reduces operating costs by $16.2/head. All the requirement for input supply, production protocols and requirement for specific breed can be legally specified in contractual arrangement. In turn, the feedlots operations that enter into contracts can secure quality premiums and obtain a higher price for cattle. Feedlots that enter into contracts also benefit from having a guaranteed market outlet through pre-specified terms, and in some cases a guaranteed price (i.e., forward contract) that might increase their revenue stability so as to allow them to focus on the production process instead of market and price discovery functions (Brocklebank and Hobbs 2004; Hayenga et al. 2000).

2.5 Alignment Problems in the Beef Industry

Vertical coordination has increased more recently due to a greater use of value-based pricing systems and contractual arrangements, but the beef market remains inefficient in transferring consumer preferences to producers via the pricing mechanism (Brocklebank and Hobbs 2004). This is primarily due to different goals that each industry segment has. Gillespie et al. (2005) indicate that while cattle feeders and packers emphasize feed conversion, cattle and feed prices, quality and yield grades, and rate of gain, cow-calf producers have incentives to focus on calving rate, birth and weaning weights, and calving ease. Although an increasing portion of fed cattle is priced on a value-based system, packers continue to buy more cattle in feedlots through contractual arrangements. At the beef packer-feedlot level, the Canadian producers are somewhat behind the U.S. with regard to managing cattle for value-based pricing system (Schroeder 2003). According to recent data, the U.S. had about 40% of fed cattle sold on cash-negotiated basis in 2002 (Schroeder 2003).[4] In contrast, 60% of fed cattle that Alberta's three largest packers bought in 2002 were on cash basis. With regard to the uses of grid pricing system, Alberta producers only sold 20% of fed cattle on a grid or formula in 2002 while it was over 50% in U.S. (Schroeder 2003).

Since most contractual arrangements are found between packers and finishing sectors, the cow-calf producers rarely receive information about the quality of their individual animals from beef packers or from the retail level (Brocklebank and Hobbs 2004). A variety of reasons have led to this limited vertical coordination. First, compared with pork and poultry, beef production entails a longer biological production cycle (i.e., 24 months) and multiple industry stages. Ward (2001) suggests that agricultural business operators are more likely to vertically coordinate in an industry that has a shorter biological process and fewer production stages. Second, the limited capital investments in buildings and equipment (e.g., fencing and building) in the cow-calf segment do not provide incentives for contracting (Gillespie et al. 2005). Capital investments in these fixed assets are useful for firms beyond cattle production. In addition, economies of scale in the cow-calf segment

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[4] The comparable statistics is based on Schroeder (2003), in which the original data for largest three packers in Alberta (source: Canfax); Data for U.S. (source: USDA).

appear to be limited, thus limiting the improvement of vertical coordination. A large number of cowherds in cow-calf operations are fewer than 30 cows per operation (Ward 2001). Given such relatively small economies of scale in the cow-calf segment, and with cattle producers typically operating on a one-year cycle, transaction costs are relatively low (Brocklebank and Hobbs 2004; Gillespie et al. 2005).

The alignment problems mentioned above challenge the coordination process of the beef industry. In section 2.4 it was emphasized that increasing information flow in the beef supply chain may play a key role to solve these alignment problems. The underlying organizational structure also provides alternative coordination mechanisms for the beef producers. As shown in **Figure2.05**, an integrated system may include seed stockers, cow-calf producers, backgrounding operations, feedlots and packers. An alternative structure might include only seed stockers, cow-calf, backgrounders and feedlots. In both organizational structures, each stage of the producers would benefit from information sharing from upstream and downstream suppliers (Schroeder 2003). For example, seed stock suppliers provide information to cow-calf operation, including breed, expected progeny differences, calving ease, weaning weights, and related production and carcass quality attributes. Cow-calf producers provide similar information, in addition to preconditioning and vaccination programs, to the feedlot, and likewise the beef packers also need to have information back from the cow-calf operations regarding cattle performance (Schroeder 2003).

From the analysis above, the information sharing schemes and the underlying organizational structure, also referred to as *vertical beef strategic alliances,* can provide a means to ensure a supply of particular quality beef be targeted to appropriate consumer segments (Hayenga et al. 2000; Schroeder 2003; Schroeder and Mark 1999; Schroeder et al. 1998; Ward 2001). Strategic alliances that vertically integrate the beef production and marketing chain enable cow-calf producers to retain ownership of their cattle through feeders or beef packers to maximize interests. Alliances can increase information sharing among producers, processors, retailers and consumers. Alliances also allow for the participation of several phases of the beef production and processing sectors, whereas contracts typically organize transactions between only two participants in the supply chain. The involvement of multiple supply chain participants further improves coordination, as economic signals relating to consumer demand are more clearly transferred to the industry participants such as cow-calf operators that typically do not receive information about consumer demands in the traditional industrial setting.

Although there are various types of alliances in the beef industry, almost every alliance has a similar objective, which is to capture and create additional value (i.e. value-added) and higher returns for participating producers (Anton 2002; Brocklebank and Hobbs 2004; Ward 2001). Therefore, almost all beef alliances overlap to some extents. For example, a market-based grid (a combined grid based on yield and quality grades) is often used to capture high premiums. And a term regarding the transfer of the ownership of cattle (retained vs. not retained) is often specified in a formal agreement (Anton 2002; Ward 2001).

We can distinguish formal and informal vertical strategic alliances. Informal strategic alliances are usually established where partners work towards achieving mutual objectives (Amanor-Boadu and Martin 1992). Under the informal agreement, different production sectors in the industry hold a high level of autonomy while self-monitoring the effect of their actions on their partners. The partners' relationship is established based on trust rather than any other legally specified forms such as contractual arrangements and commitment to initial capital investment (Amanor-Boadu and Martin 1992). In contrast to informal alliances, formal strategic alliances involve more organized and managerial criteria such as control and equity to meet the objective of the different parties in the alliance (Amanor-Boadu and Martin 1992).

Anton (2002) provided a categorization of formal alliances in beef industry in terms of the marketing characteristics of a alliance, which includes cooperatives, brand programs, specialty product marketer programs, and externally coordinated beef programs.. Specifically,

(1) Cooperatives are producer-owned entities (e.g., US Premium Beef) to provide the highest opportunity for additional returns (e.g., price premiums). In the case of the closed cooperative, an initial capital investment is needed and a grid-pricing system is used (Brocklebank and Hobbs 2004). A stable and formal management structure is achieved by initial capital investment. For example, producers must either buy part of the company as stock shares or lease shares from other producers who have excess shares (Anton 2002). The premiums and discounts can be provided on the grid to maximize the benefits of producers. In addition, closed cooperatives normally pay dividends on the stock, and some have additional bonuses paid to producers who market cattle through the program (Anton 2002).

(2) Brand licensing organization programs (e.g., Certified Angus Beef, Certified Hereford Beef) often require the cattle to meet a certain genetic requirement. They create value by centering the program on a branded product that conveys a certain standard of quality to consumers (Anton 2002). The brand licensing organization programs are very loose contractual arrangements comparing to cooperatives, with the only obligation being the certification under inspection agency (Anton 2002; Brocklebank and Hobbs 2004).

(3) Specialty product marketer programs are also one of the brand licensing programs. However, a stricter rule is normally specified (Anton 2002). In addition to the breed template, they usually have certain additional production stipulations that usually are more technical production protocols (e.g., complexly structured veterinary program) in the production process. Both qualities based and yield based grids are used in such programs (Anton 2002). These production protocols potentially result in an increasing investment in asset specificity.

(4) In addition to the forms of beef alliances mentioned above, some externally coordinated beef programs have emerged in recent years. The main characteristic of this program is that it is a new fully vertically integrated program involving the entire supply chain. It can be branded or non-branded. For example, Future Beef Operations, which is now bankrupt, was the first such initiative in the U.S. that attempted to coordinate cow-calf producers, feedlots, packers and retailers through the formation of a new entity (Brocklebank and Hobbs 2004).

As shown in the previous analysis, beef alliances can be more successful alternative organizational structures for beef producers, particularly for cow-calf producers. However, one of the key questions is what types of beef alliances cow-calf operations are willing to participate in, and how do they value the attributes that characterize these alliances. From the above discussion, we would expect that a successful beef alliance must provide the participants with sufficient financial incentives and employ an efficient information sharing mechanism. The empirical part of this study will focus on these and other attributes in an analysis of beef alliances.

2.6 Summary and Conclusions

The objective of this chapter was to provide background information on the current structure and organization of the beef industry in North American industry. The chapter examined reasons for the current transformation of the beef industry, as it is moving away from the production of commodity oriented beef products. In general, increased vertically coordination in the beef industry of North America has resulted from shifts in consumer demand, advances of technology, information exchange management, and efforts of producers to reduce either production or transaction costs. The last section of the chapter discussed alignment problems in the beef industry, focusing on alternative beef alliances. The alignment problems in the Canadian beef industry appear to be closely related to issues at the cow-calf level. Previous studies have already pointed to the cow-calf operators' lack of incentives to participate in vertical coordination mechanisms, due their relatively small scale of operation. It is therefore desirable to examine the cow-calf producers' attitudes towards alternative vertical coordination schemes, such as beef alliances. The next chapter will examine the structure of the beef industry from a theoretical perspective. It tries to explain the movement towards improved coordination in beef industry.

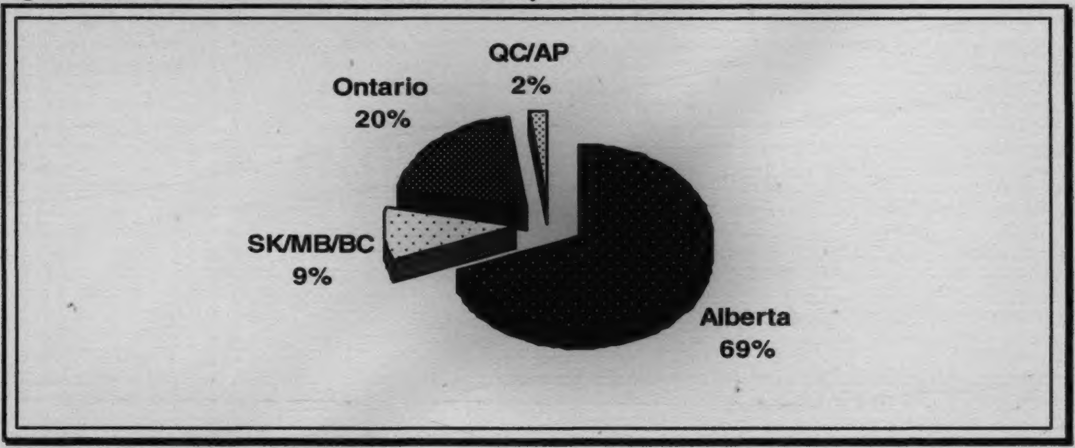
2.7 Appendix: Tables and Figures

Table 2.01 Canadian Beef Cattle Distribution per Farm Type, by Province, East, West and Canada (Jan. 1, 2006)

Location	Cow-calf Operations	Percentage of Total Inventory	Feeder, stocker/finish Operations	Percentage of Total Inventory	Feeding Operations	Percentage of Total Inventory
Atlantic	93.1	1.02%	43.9	2.34%	25.3	1.60%
Quebec	419.1	4.59%	72.8	3.89%	85.5	5.42%
Ontario	761.1	8.33%	222.9	11.90%	312	19.77%
British Columbia	448	4.90%	57.8	3.09%	21.5	1.36%
Manitoba	1154.6	12.63%	196.1	10.47%	61	3.86%
Saskatchewan	2592.9	28.37%	203.8	10.88%	98.5	6.24%
Alberta	3670.7	40.16%	1075.6	57.43%	974.5	61.74%
Western Province	7866.2	86.07%	1533.3	81.87%	1155.5	73.21%
Eastern Province	1273.3	13.93%	339.6	18.13%	422.8	26.79%
Canada	9139.5	100.00%	1872.9	100.00%	1578.3	100.00%

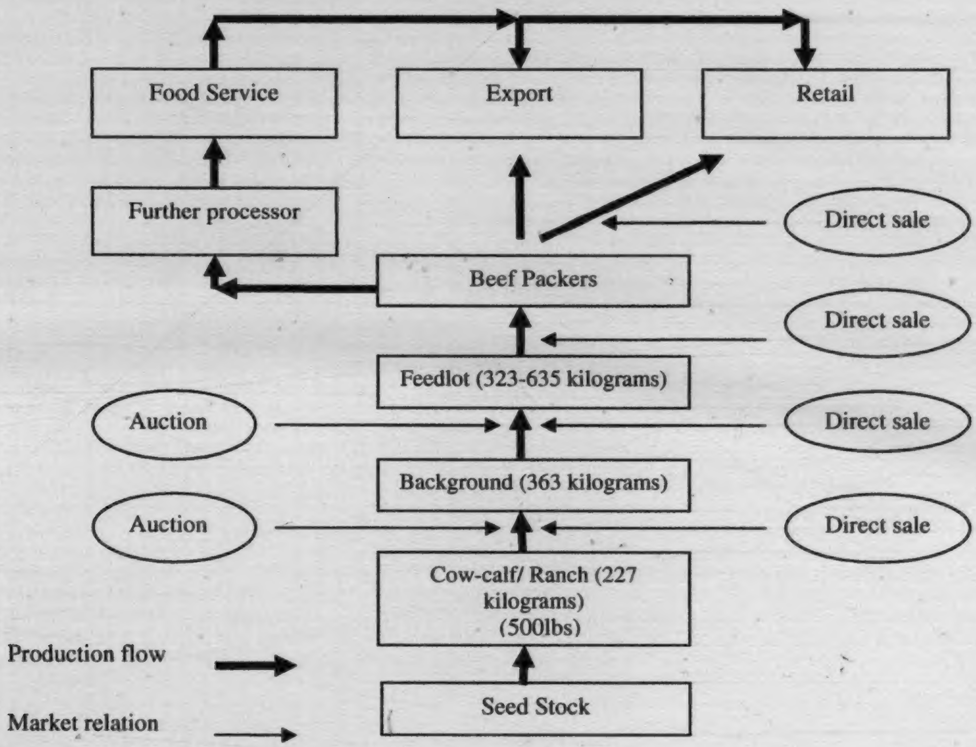
Source: Canfax, Statistics Canada 2006

Figure 2.01 Canadian Fed Cattle Production by Province - 2005



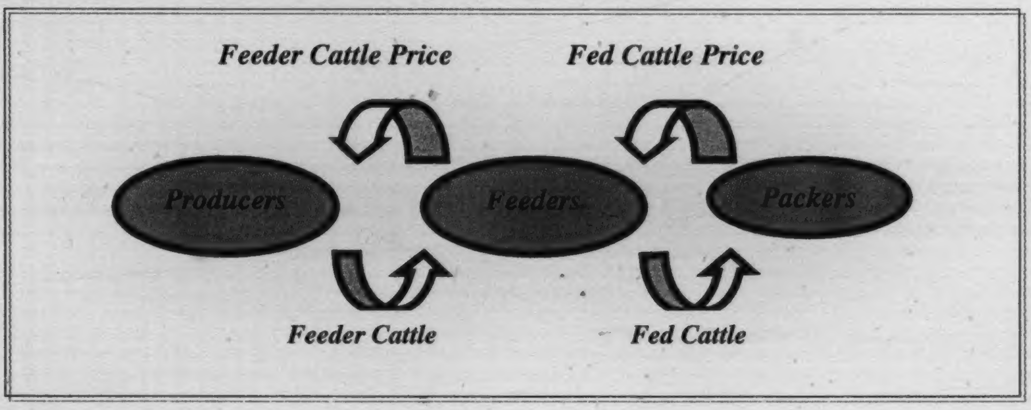
Source: Canfax, Statistics Canada 2006

Figure 2.02 Traditional Cattle and Beef Industry Value Chain


Food Service
Export
Retail
Further processor
Direct sale
Beef Packers
Direct sale
Feedlot (323-635 kilograms)
Auction
Direct sale
Background (363 kilograms)
Auction
Direct sale
Cow-calf/ Ranch (227 kilograms) (500lbs)
Production flow
Market relation
Seed Stock

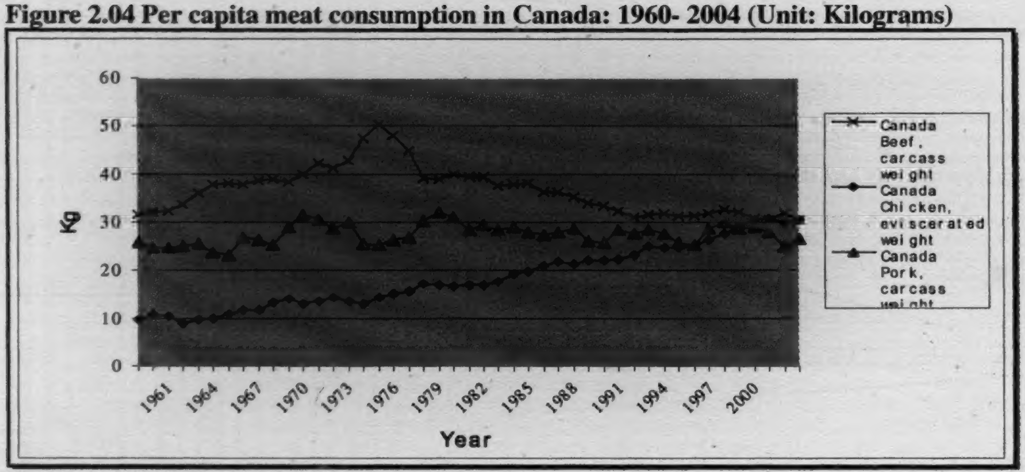
Source: own

Figure 2.03 Traditional Beef Industry Transactions


Feeder Cattle Price
Fed Cattle Price
Producers
Feeders
Packers
Feeder Cattle
Fed Cattle

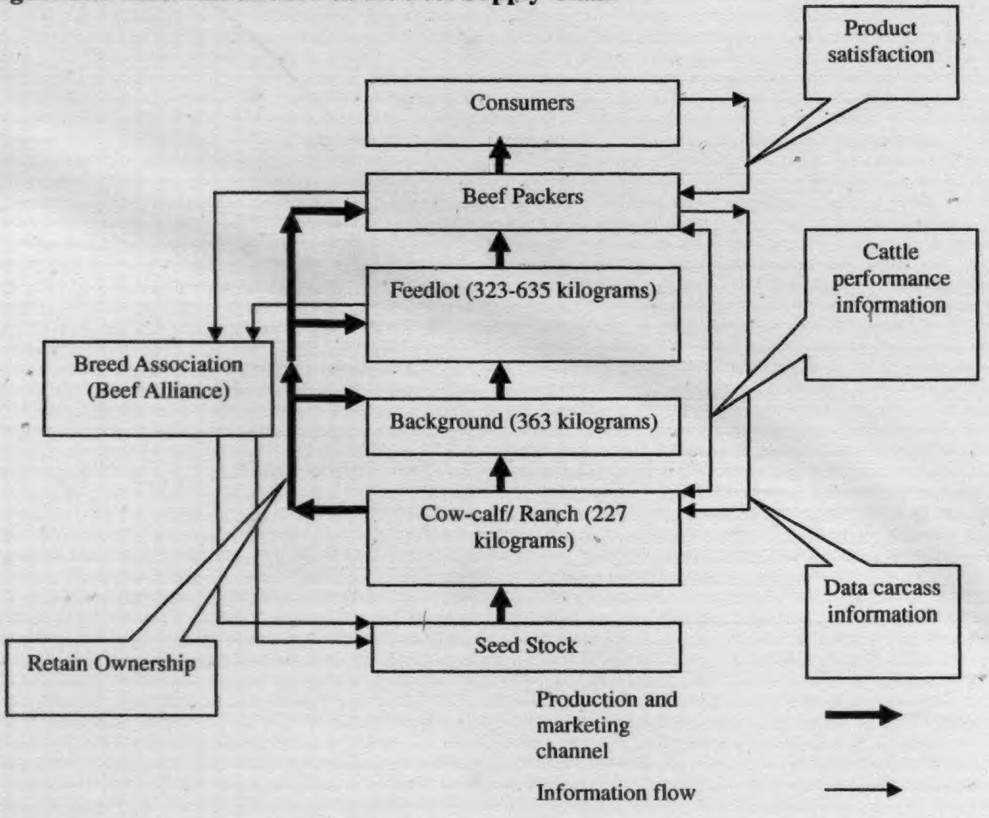
Source: Hudson (2001)

Figure 2.04 Per capita meat consumption in Canada: 1960- 2004 (Unit: Kilograms)



Source: CANSIM, Statistics Canada

Figure 2.05 Information Flow in the Beef Supply Chain



Product satisfaction
Consumers
Beef Packers
Cattle performance information
Feedlot (323-635 kilograms)
Breed Association (Beef Alliance)
Background (363 kilograms)
Cow-calf/ Ranch (227 kilograms)
Data carcass information
Seed Stock
Retain Ownership
Production and marketing channel
Information flow

Source: own

Chapter 3 Literature Review

3.1 Introduction

Explanations for both contractual arrangements and strategic beef alliances can be based on theories focusing on vertical coordination. As discussed in Chapter 1, this study focuses on more formal strategic alliances in beef industry, especially on the cow calf operations' preferences for specific attributes of beef alliances. Therefore this chapter will discuss theoretical perspectives that have been used in research on strategic alliances. This chapter is divided into two main sections. The first section introduces some conceptual frameworks on vertical coordination. It then reviews major theories of vertical coordination and empirical works in the fields of both agricultural economics and strategic management that explain the vertical coordination phenomenon. Both the theoretical framework and the empirical applications are used in our selection of appropriate attributes and attribute levels for our empirical study of cow-calf producers.

3.2 Conceptual Framework of Vertical Coordination

Vertical coordination refers to all means of aligning, harmonizing and consolidating vertically independently production and distribution activities. This vertical arrangement that reaches from the downstream farm production stage to the upstream consumer stage ranges from spot markets through various types of contracts to complete integration (Frank and Henderson 1992). As discussed in Chapter 2, the organization of individual stages of beef production such as cow-calf, backgrounding, finishing, processing and wholesale/retail, is the vertical array of the beef production continuum.

Evolution of vertical coordination in agriculture is a gradual and complex procedure. Based on Williamson (1973; 1975), Peterson et al. (1998) has proposed that the vertical coordination continuum has five major categories of vertical coordination strategies: spot markets, specification contracts, relation-based alliances, equity-based alliances, and vertical integration. Peterson et al. (1998) also suggest that the "intensity of control" that are associated with alternative strategies of coordination could be used to distinguish the coordination continuums. Wysocki et.al (2004) further suggest that the intensity of control leads the coordination strategies to "…*move from low levels of ex ante control intensity (spot markets) to high levels of ex post coordination control (vertical integration) while passing through several transitional levels of ever-increasing intensity (specification contracts, relations-based alliances and equity-based alliances)…*(pg 175)" [5]. Wysocki, et al., (2003) summarize the definition of each categories of these strategic options (**Table 3.01**). Our research will primarily focus on these three middle-level strategies (i.e., specification contract, relation-based alliance, and equity-based alliance).

3.3 Overview of Theoretical Approaches to Vertical Coordination

It is not possible to explain the organizational structure by considering a single theory (Boehlje 1999). Historically, a variety of disciplines have been used to make valuable contributions to explain the vertical coordination mechanism in agriculture. These include value-chain analysis, transaction cost and principal-agent theories; strategic management and organizational learning; theories focusing on negotiation/power, trust, and performance incentives. Among these theories, transaction cost, agency theory and property rights theory have common intellectual antecedents and have traditionally been applied to an institutional economics approach to the discipline of strategic management (Kim and Mahoney 2005). According to Williamson's (1985), transactions cost economics (TCE) theory can be an important theoretical framework for analyzing the variety of governance structures employed through vertical coordination. TCE addresses that minimizing transaction costs is the primary motivation for adopting alternative organizational structure such as alliance. Both agency theory and property rights theory concentrate on incentive alignment as a theoretical framework for understanding and researching organizational structures (Eisenhardt 1985; Hart and Moore 1990; Jensen and Meckling 1976).

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[5] **Figure 3.01** presents a graph including each category of vertical coordination strategy in terms of 'intensity of control'.

3.4 The Transaction Cost Approach (TCE)

3.4.1 Key idea

The key idea of TCE is that transactions between separable production stages are organized in such a way that the costs of carrying them out are minimized. Transaction costs refer to the costs that are involved in arranging, managing, and monitoring transactions across markets, including the barging or negotiation cost, search and information costs (Child and Faulkner 1998). TCE predicts that transactions under uncertainty, which recur frequently and require substantial transaction specific investments, are more likely to take place within hierarchical organizations (Williamson 1985).

3.4.1.1 Behavioral Assumptions

Transaction cost theory is based on two main behavioral assumptions: bounded rationality and opportunism. Bounded rationality refers to the fact that people (agents) are intended rational, but are limitedly acting in this manner. According to Williamson (1975), bounded rationality is result of uncertainty about the intentions and competencies of a transaction partner. Due to incomplete or asymmetric information, agents cannot gather and process all the information they need. Further, agents may have limited processing capacity and they may be prone to opportunism (Williamson 1979). In sum, the TCE recognizes that many economic activities occur in the environment of incomplete and asymmetric information, which can lead to opportunistic behavior and thus adverse selection and moral hazard. Adverse selection is referred to the situation where information is hidden prior to a transaction. In contrast, a moral hazard problem is said to exist when the agent's action is not verifiable, or when the agent receives private information after the relationship has been initiated (Macho-Stadler and Pérez-Castrillo 2001). Thus, in the presence of moral hazard there is a tendency for the agent to shirk on those actions that are unobservable to the principal. In the beef industry, both adverse selection and moral hazard problems appear to be present at the different production stages. These issues will be discussed in more detail below.

3.4.1.2 Characteristics of Transactions

According to Williamson (1985), there are three characteristics influencing the size of the costs accompanying transactions: (1) asset specificity, (2) uncertainty, and (3) frequency of transactions. Asset specificity refers to the investment that an agent is required to incur in order to participate in a formal relationship. The implication is that once agents have invested into specific requirements of a principal-agent relationship, the principal may have an incentive to re-negotiate the contract terms, knowing that the agent's investment is of lower value outside of the relationship. As a result, the principal is said to hold-up the agent (Salanié 2005). Further, when a transaction is conducted more frequently, it is more likely to be internalized, since damages from opportunistic behavior are expected to be higher (Williamson 1979).

3.4.2 Implications for Research on Beef Alliances

Hobbs (1997) has analyzed transaction cost variables that have a significant effect on cattle-breeders' decision whether to sell deadweight, direct-to-packer or live weight, including live-ring auctions. Based on the transactions cost framework, her analysis aims to explore the reasons behind producers' decisions for choosing one of the above-mentioned distribution channels in the United Kingdom. In another study on the cattle industry, Ayars (2003) developed a theoretical framework to measure transaction costs. The study uses empirical evidence to derive transaction cost estimates for five finishing feedlots in Saskatchewan. The results suggest that larger feedlots have lower transaction costs in buying and selling cattle than smaller feedlots. In a recent study of beef alliances and branded beef programs, Brocklebank and Hobbs (2004) analyzed the attributes of different types of beef supply chain alliance under the transaction cost theory framework. A conjoint analysis was used to examine how different product (service) attributes result in the emergence of particular transaction characteristics (assets specific investments, uncertainty and frequency). From the review of the literature above, the emergence of alliances within the beef sector could be related to assets specific investment between alliance participants (Hudson 2001). It is expected that the presence of asset specificity impacts the producers' willingness to participate in an alliance program.

The second possible contribution of TCE to the beef alliance research relates to the uncertainty inherent in transactions. The price uncertainty with which particularly cow-calf producers are faced with can affect both quality variability and the numbers of willing buyers (Brocklebank and Hobbs 2004). However, although price uncertainty is very important in affecting transactions in beef alliance, the measurement on uncertainty is difficult to realize within the TCE framework due to the data limitation. More importantly, price uncertainty is largely determined by the adoption of grid pricing system in current beef industry, which is mainly used between feedlots operations and processors, rather than affecting cow-calf producers directly (Brocklebank and Hobbs 2004). Transaction cost analysis would also lead us to expect that alliances operate more effectively, if there are fewer partners involved. However, their study suggests that the number of buyers/sellers in the market has no significant impact on cow-calf producers' willingness to participate in the branded program and beef alliance (Brocklebank and Hobbs 2004).

3.5 Agency Theory Approach

Agency theory is an alternative theoretical framework for analyzing vertical coordination. It complements the transaction cost approach and provides explanations of inefficiencies stemming from asymmetric information and incentive problems in vertical coordination (Ferguson 2004). Principal-agent theory thus focuses on the design issues of contractual arrangements between trade parties (Sauvée 1998).

3.5.1 Key Idea

3.5.1.1 Principal-Agent Theory

Agency theory focuses on the interrelationships between principal and agent. Typically, an agency relationship consists of a principal and an agent: a risk neutral principal (owner) and a risk-averse agent (user). The basic principal-agent problem can be separated into three different categories: the adverse selection problem, the moral hazard problem and the signaling problem. The signaling problem is a situation that is related to the adverse selection problem. In the former, the agent can send a signal that is observed by the principal after learning the characteristics of the agent (Macho-Stadler and Pérez-Castrillo 2001). Therefore, the agent can adopt actions before signing the contracts to influence the beliefs of principals about the agents' identity. The optimal contract scheme contains appropriate incentives for the agent to behave, or create output, in such a way that maximizes the returns to the principal and total surplus of both parties. Analytically, the problem can be solved by assuming that the principal selects the reward function that maximize his expected profits, while the agent chooses his effort to maximize his expected utility, given the structure of his reward function (Brown and Vukina 2001).

3.5.2 Implications for Research on Beef Alliances

Agency theory has also been used as a complement to the TCE approach in research on vertical coordination. In an empirical analysis on crop production contracts, Lajili, et al. (1997) use elements of both principal-agent theory and transaction cost economics to analyze farmers' preferences for contract terms. The results indicate that farmers' preferences for rates of cost sharing, price premiums, and financing arrangements are significantly influenced by asset specificity, selected business and personal characteristics. Agency theory is also used to analyze the agricultural cooperatives' governance structure and to design optimal incentive contractual arrangements in new generation cooperatives. Kalogeras et al. (2004) adopt a principal-agent approach to analyze the structure of marketing co-ops (MCs) based on members' preferences. Their study focuses on subjective utility that co-op members derive from levels of the MCs' firm-behavioral attributes, such as governance structure, product-related decision-making, financial structure, member benefits sharing scheme, and product quality.

With regard to the empirical research in livestock industries, research on compensation schemes and risk sharing contracts has focused on pork and poultry. Goodhue (2000) uses an agency theoretic framework to analyze grower heterogeneity and production risk among broiler contracts. She shows that by forcing agents to bear additional income risk, processors can increase profits due to the combined moral hazard-adverse selection nature of the informational problem. Wang and Roe (2002) allow for double-sided moral hazard in an analysis of cattle feeding production. Their analysis is based on the observation that post-slaughter quality-based pricing of cattle is increasingly common. This quality, however, is dependent upon unobservable quality characteristics of the feeder cattle used as inputs and unverifiable effort exerted by feedlot managers. The authors (Wang and Roe 2002) construct incentive compatible quality risk-sharing contracts based upon final grid-quality schedules in feeder cattle markets through stochastic simulation. Their analysis suggests that there is the potential for moral hazard in traditional feeder cattle transactions. With regard to the cow-calf sector, the moral hazard problem exists in a simple spot market transaction because the cow-calf operator has little incentive to exert effort to improve unobservable quality traits. The potential exists for moral hazard on the feedlot side of retained ownership contracts because feedlot operators may not profit from effort spent on sorting or may increase profits by delaying slaughter dates. Further, they suggested that a linear premium/discount sharing contract would circumvent the double-sided moral hazard problem because it provides both parties incentives to make high levels of efforts.

3.6 Property Rights Theory and Incomplete Contract Theories

3.6.1 Key Idea

Libecap (2002) defined the property rights as socially sanctioned uses of valuable assets by economic agents. More broadly, property rights refer to the responsibility and positions of parties in the market and within the firm (Libecap 2002). This definition implies that there could be *a shared ownership*, which means that different individuals may hold property rights to various partitioned uses of a certain single resource (Kim and Mahoney 2005).

As Furubotn and Pejovich (1972) indicate, an economic transaction essentially is the exchange of bundles of property rights. Therefore the exchange of property rights can determine the resource allocation, and partitioning of property rights is the economic principle that drives the various applications of property rights theory. In any kind of institutional arrangement where more than two contracting parties are involved, resource owners must transfer to another transacting party the control over some attributes of a resource. Various institutional and contractual arrangements attempt to allocate property rights to multiple contracting parties in a way to achieve economic efficiency. As a result, it is assumed that appropriate economic incentives are created for the owners of each bundle of property rights (Kim and Mahoney 2005).

3.6.2 Incomplete Contracts, Property Rights and Vertical Coordination

Historically, property rights theory has common intellectual antecedents with transaction cost theory and agency theory that have traditionally been applied to an institutional economics approach to the discipline of strategic management (Barney and Ouchi 1986). Similar to transaction cost theory (Williamson 1975, 1985), the so-called 'classic property rights theory' was also rooted in the early classic works of Coase (1937; 1959). The other stream was developed by Grossman and Hart (Grossman and Hart 1986), Hart and Moore (Hart and Moore 1990), which refers to 'modern property rights theory' and refers to the owner of an asset as the holder of residual rights of control (also sometime called 'GHM model'). In contrast to 'classic' form of property rights theory, which focuses on the historical and institutional framework of property rights, the 'modern' property rights theory, attempts modeling ownership and incentive structures in different socioeconomic settings (Kim and Mahoney 2005).

The modern version of property rights theory is associated with incomplete contract theory. If contracts were complete, then ownership would not be an issue regarding economic efficiency, since there are no residual control rights and each contingency would be specified in the contract (Kim and Mahoney 2005). But most real world contracts are almost always incomplete due to bounded rationality such that some contingencies cannot be specified, or due to the cost of writing complex contracts. As contracts are incomplete, ex post activities such as negotiation must often be excelled to ensure the payment and actions (Hendrikse and Bijman 2002). Consequently, because of this unspecified portion of the contract, there are potential economic problems in investing in ex ante relationship-specific assets due to the hold-up problem (Grossman and Hart 1986). The hold up problem prevents a firm to invest since it cannot protect its investment sufficiently in the relationship due to the potential of being exploited as a result of contract re-negotiations. Therefore, if the relationship is terminated prematurely as a result of such re-negotiation, part of the revenue generated by a relationship-specific investment (i.e., quasi-surplus) will not recovered (Bijman and Hendrikse 1999).

Researchers have suggested that vertical integration may solve this problem (Klein et al. 1978; Williamson 1979, 1985). However, vertical coordination brings costs as well as benefits because a shift in ownership affects the incentives to invest of the firms concerned (Grossman and Hart 1986). In the view of modern property rights theory, a shift of ownership and the associated change in residual rights of control affects the ex ante investment incentives of contract parties (Bijman and Hendrikse 1999; Hendrikse and Bijman 2002).

3.6.3 Implications for Research on Beef Alliances

Insights from property rights theory may be useful to beef alliance research in two areas. First, it helps us to understand changes in the boundaries of the firms, in particular observed shifts of ownership of cattle in terms of retained ownership as practiced by cow-calf producers. Kim and Mahoney (2005) assert that the contractual party that retains ownership is the party that has the most to gain from the building of relationship-specific assets. Retained ownership in beef industry refers to cow-calf producers can hold title of their calves beyond the customary period (Saskatchewan Agriculture and Food 2001). Under a retained ownership program the cow-calf producer would retain title of the calves after weaning as they move into backgrounding and/or feedlot programs. One way to retain ownership of cattle is through contractual "custom feeding" arrangements where the calves would be backgrounded and finished in custom feedlots. Cow-calf producer that retains ownership of the calves through custom feeding agreement do not need to invest in additional facilities, equipment, feed or labor to finish the animals (Saskatchewan Agriculture and Food 2001).

Further, the incomplete contracts approach is of some relevance to the present study, since the issue of residual rights of control relates directly to the marketing problems of various forms of formal beef alliances: beef alliances can be distinguished in terms of their boundaries of asset ownership, and thus in terms of the incentives that are associated with these boundaries. For example, according to Cook (1995), traditional marketing cooperatives are facing internal incentive problems resulting from three "vaguely defined property rights", which include the free rider problem, the horizon problem, and the portfolio problem. The free rider problem results when property rights are insecure, unassigned, or untenable. In this situation, gains from cooperative action can be accessed by individuals that did not fully invest in cooperatives, whether those individuals are new members or non-members. The horizon problem emerges in a situation when a member's residual claim on the net income generated by an asset is shorter than the productive life of that asset (Unterschultz and Gurung 2002). The portfolio problem stems from the tied nature of the equity in the cooperative. The risk-averse members of cooperatives cannot withdraw and reallocate their investment when the organization's investment portfolio may not reflect the interests of investor. All these different incentive problems increase the transaction costs of managing the cooperative organization and affect members' incentives to invest in the organization and the organization's overall ability to generate equity capital. In addition, Cook and Iliopoulos (2000) found that members are more willing to invest in equity when the cooperative is characterized by structures such as closed membership, marketing agreements, and transferable and appreciable equity shares; all structures that tend to reduce the free rider, horizon, and portfolio problems.

3.7 Summary and Conclusions

This chapter briefly discusses theories associated with vertical coordination and strategic alliances. It is argued that transaction cost economics (TCE), agency theory and property rights theory each can help to explain the extent to which incentive and alignment issues can be explained in different forms of formal beef alliances. Specifically, TCE contributes to this study primarily in explaining the cause of emergence of beef alliances; agency theory can help us to understand the incentive problems in strategic alliances; property rights and incomplete contract theories can help to explain the practice of retained ownership of cattle in the beef industry. The following empirical part of this thesis attempts to address some of the incentive problems that were raised in the above sections, by inquiring about transaction costs, producers' risk attitudes, and their risk management strategies (portfolios). The next chapter will first discuss the theoretical basis of the survey methods and choice experiments used to make those inquiries.

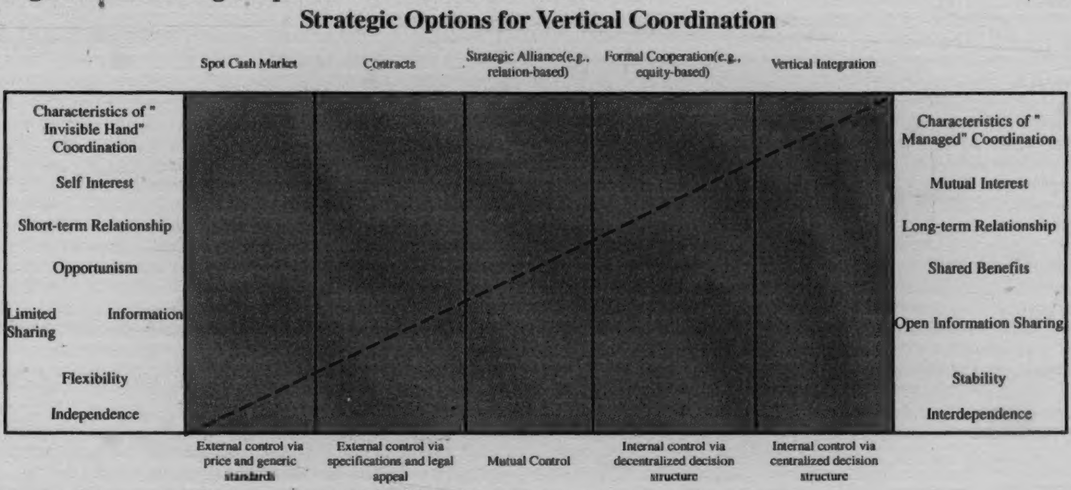
3.8 Appendix: Tables and Figures

Table 3.01 Strategy Categories along the Vertical Coordination Continuum

Strategy	Definition	Example
Spot Market	Coordination intensity is low. Parties engage in price discovery and make either a yes or no decision to enter the transaction. It is easy to walk away from the transaction.	A Midwest corn farmer who calls up local grain elevators to find out the current cash price for corn. The corn farmer decides to sell his corn to the highest bidder.
Specification Contract	Coordination intensity is moderately low. Contracts are based on the legally enforceable establishment of specific and detailed conditions of exchange.	A potato farmer that signs a production contract with a potato processor for a specific quality and quantity of potatoes at a specified delivery time.
Relation-Based Alliance	Coordination intensity is moderate. Relationship based on shared risk and benefits emanating from mutually identified objectives.	Wal-Mart and Procter & Gamble, where Wal-Mart agrees to share propriety sales and inventory information and P&G physically locate their employees at Wal-Mart's headquarters.
Equity-Based Alliance	Coordination intensity is moderately high.	Agricultural cooperative, private firms who form a joint venture.
Vertical Integration	Coordination intensity is high.	Tyson coordinates the entire poultry process from genetics to the retail shelf.

Source: Wysocki, et al. (2003) pg. 114

Figure 3.01 Strategic Options for Vertical Coordination


Strategic Options for Vertical Coordination
Spot Cash Market
Contracts
Strategic Alliance(e.g., relation-based)
Formal Cooperation(e.g., equity-based)
Vertical Integration
Characteristics of " Invisible Hand" Coordination
Self Interest
Short-term Relationship
Opportunism
Limited Information Sharing
Flexibility
Independence
Characteristics of " Managed" Coordination
Mutual Interest
Long-term Relationship
Shared Benefits
Open Information Sharing
Stability
Interdependence
External control via price and generic standards
External control via specifications and legal appeal
Mutual Control
Internal control via decentralized decision structure
Internal control via centralized decision structure

Source: Peterson and Wysocki; Copyright@ 1997 by H.C. Peterson and Allen Wysocki

Chapter 4 Modeling, Survey Design and the Sample

4.1. Introduction

This chapter focuses on issues relating to choice modeling, research methodology and on the data used in this study. Descriptions of the survey design, the application of the econometric model and the data are included. In section 4.2 a theoretical framework for the survey instrument and modeling beef alliance choice is presented. A stated preference method is applied in this study. Section 4.3 describes the design of survey questionnaire that provided data for the study. The last section of the chapter describes issues relating to the data collection and the data sample.

4.2. Theoretical Framework for the Survey Instrument and Modeling Beef Alliance Choice

4.2.1 Revealed Preference vs. Stated Preference Methods

Revealed preference (RP) methods, such as hedonic pricing methods, draw statistical inferences on values from actual choices people make within markets. Often, the revealed preference approach involves the observation of choices made by decision makers and then the comparison of the observed choices to the rejected alternatives (Adamowicz et al. 1994; Hensher et al. 2005). However, RP methods cannot be used in a direct way to evaluate preferences under conditions which do not yet exist (Louviere et al. 2000). In addition, RP data and RP techniques cannot provide appropriate statistical properties that we wish for modeling purpose. The nature of homogeneous market structure under the perfect competition, the imitation instead of innovation given the high cost of the copyright, R&D and cost in changing the marketing mix, all of these reasons contribute the invariability of RP data (Hensher et al. 2005). In this case, attributes invariance poses modeling problems since an attribute that takes on the same value for all alternatives cannot help explain why individual respondent has different choice on a specific product or service. Therefore, some new techniques were developed to directly examine hypothetical choice procedure. One of these techniques is the stated preference method which is applied in this study.

Following Adamowicz et al., (1998), the stated preference methods (SPM), also referred to as stated choice analysis or choice experiment, use a variety of approaches for asking valuation questions in hypothetical settings, from the straightforward request for maximum willingness to pay open-ended contingent valuation, to indirect methods using choice, ranking, or ratings. Stated choice method generally employs carefully designed questionnaire in which respondents are given a sequence of questions or choice sets. In each choice set, they are asked to indicate their preferred option from a set of hypothetical alternatives. Each alternative option is described in terms of a number of key attributes that are specified at different levels. The configuration of attribute levels that describe the alternatives follows an experimental design and varies between choice sets. The response data, which usually also include individuals' socio-economic characteristics, enable not only the estimation of the relationships between attribute levels and the choice probabilities, but also the estimation of the extent of the trade-offs between the attributes made by individuals.

For example, with regard to research on agricultural policies, Roe and Randall (2002) suggest that the use of stated preference instruments could be used to derive trade-offs that farmers are willing to make between current and future farm programs. These trades-offs and the resulting welfare measures, for example of key agricultural policy attributes, can be derived from the econometrical estimation of discrete choice data. As emphasized above, this study aims to explore alternative marketing and production arrangements between the cow-calf operation and upstream producers, and their potential to improve incentive and alignment issues. These new alternative schemes somehow are new entrants that do not yet exist at present. Therefore, the hypothetical choice-based experiment has to be applied into this study.

4.2.2 Random Utility Theory and Binary Choice Model

4.2.2.1 Random Utility Theory

Choice experiments can be analyzed by relying on discrete choice models. The latter are derived under the assumption of utility-maximizing behavior of the decision maker (Hensher et al. 2005). The utility derived from a good or service is assumed to be dependent on its characteristics or attributes (Lankaster 1966). In the discrete choice framework, a decision maker is modeled as selecting the discrete alternative with the highest utility among those available at the time the choice is made. Since there are factors in the decision-making procedure that unobservable to decision-makers, random utility theory is used to model observed behavior. Within the random utility framework, a utility function can be specified, which expresses hypotheses about the way in which individual respondents combine their part-utilities into an overall evaluation or preference. Following Ben-Akiva and Lerman (1985), Kolstad and Braden (1991), Louviere (1994) and Adamowicz et al. (1994), a general random utility function can be expressed as;

(1) $U_{in} = V(X_{in}) + \varepsilon_{in}$

Where

U_{in} = person n's utility of choosing alternative i,

V_{in} = indirect utility,

X_{in} = a vector of attribute values for alternative i as viewed by respondent n, and

ε = a random element.

Total utility, U_{in} is therefore a sum of observable and unobservable components which can be expressed as V_{in} and ε_{in} respectively. The utilities are not known with certainty and are treated as random variables. From this perspective, the choice probability of alternative i, is equal to the probability that the utility of alternative i, U_{in}, is greater than or equal to the utilities of all other alternatives in the choice set. This process can be written as follows:

(2) $P_n(i|C_n) = P_r[U_{in} \geq U_{jn}, \forall j \in C_n]$

(3) $P_n(i|C_n) = P_r[V_{in} + \varepsilon_{in} \geq V_{jn} + \varepsilon_{jn}, \forall j \in C_n]$

Where C_n denotes the choice set for respondent i.

4.2.2.2 Binary Choice Models

In the survey used for this study, individuals are asked to choose between two alternative beef alliances. With regard to the attributes of a beef alliance, it is assumed that interaction effects are negligible and therefore only main effects are assessed. A 'main effects' is the effect of the variable averaging over all levels of other variables in the experiment (Hensher et al. 2005; Louviere et al. 2000). Using a main effects plan in experiment design can keep the orthogonality of the each attribute and reduce the treatments of full factor factorial design (Louviere et al. 2000). Following the random utility theory outlined above, V_{in} is the indirect utility function associated with the respondents' utility from participating in a particular beef alliance. It is thus assumed that when an individual chose to join a particular beef alliance, with particular alliance attributes and attribute levels, the individual's choice reflects the benefits and costs of this alliance to the individual. As a result, the dependent variable is defined such that:

$$(4)\quad Y_{in} = \begin{cases} 1 \text{ if Alliance A is chosen} \\ 0 \text{ if Alliance B is chosen} \end{cases}$$

The probabilities associated with this choice are:

$$(5)\quad \Pr ob(AllainceA) = \Pr ob(Y = 1) = \Pr ob(V_{An} - V_{Bn} \geq \varepsilon_{Bn} - \varepsilon_{An})$$

$$\Pr ob(AllainceB) = \Pr ob(Y = 0) = \Pr ob(V_{Bn} - V_{An} \geq \varepsilon_{An} - \varepsilon_{Bn})$$

The deterministic components ($V's$) are obtained from the choice experiments. The random components ($\varepsilon's$) are by definition unobservable and are incorporated into the model. A cumulative distribution function must be specified for the disturbance term in order to estimate this model. The two most commonly used forms are the normal distribution (used in probit models), and the Weibull or Type I extreme value distribution (used logit models). Typically, dichotomous choice data are analyzed using logit models, partly because the underlying logistic distribution allows for more convenient estimation compared to other binary choice models (Greene 2003). Following Greene (2003), the specifications of both models can presented as follows,

(6) $$\Pr ob(y=1) = 1 - L\left[-\sum_{k=1}^{k}\beta_k x_k\right] = \frac{e^{\sum_{k=1}^{k}\beta_k x_k}}{1+e^{\sum_{k=1}^{k}\beta_k x_k}},$$

which represents the probability of an event occurring, where L is the logistic distribution function, and beta denotes the coefficient estimates, x denotes deterministic component of a utility function. For the probability of non-occurrence, the probability is one minus the event probability, hence

(7) $$\Pr ob(y=0) = L\left[-\sum_{k=1}^{k}\beta_k x_k\right] = \frac{e^{-\sum_{k=1}^{k}\beta_k x_k}}{1+e^{-\sum_{k=1}^{k}\beta_k x_k}} = \frac{1}{1+e^{\sum_{k=1}^{k}\beta_k x_k}}$$

Assuming that the deterministic component of a utility function X_i can be represented by a linear additive combination of the attributes of an alternative and the unknown parameters as the following functional form:

(8) $$X_i = \beta_1 + \beta_2\chi_2 + ... + \beta_k\chi_k$$

In this form, the model has a compensatory or trade-off interpretation between the x's. In the experiment design, decision attributes X_i are termed "factors", and the values that each factor takes on in the experiment are called "levels." Equation **(6)** and **(7)** are the basis for the binary logit model which can be estimated using maximum likelihood techniques. Using this binary choice framework, specific attributes of beef alliance were analyzed from a choice experiment. The following sections outline how the survey and choice experiment was designed.

4.3 The Survey Instrument

4.3.1 Study Area and survey design

The study area was limited to four western provinces, namely, British Columbia, Alberta, Saskatchewan and Manitoba. Based on membership lists that were made accessible from beef producers associations, and as a result of associations' active efforts to approach cow-calf producers for participation in this survey, 951 cattle producers were initially contacted by telephone, to inquire their willingness to participate in an online-survey or an equivalent on-site survey. The respondents were told that the exact same survey would be used in on-site interviews, where trained students would conduct the survey at the farm gate, using an electronic version of the survey on a laptop. No financial incentives were given for participation. The survey varied in length, since it was constructed in a tree-structure, to circumvent questions most effectively that would not apply to a particular type of cow-calf producer. On average, it took 15 minutes to complete a survey.

4.3.2 Design of the Choice Experiment

The study follows Hensher, et al. (2005) in the design of choice experiments, by following eight stages of the experimental design process. These stages are 1) research problem refinement; 2) specifying attributes and attributes levels; 3) specifying the experiment design considerations (e.g., model form, type of design); 4) generating experiment design; 5) allocation of attributes; 6) creating choice sets; 7) randomizing choice sets; and 8) creating survey instruments. In this study, the research problem underlying the choice experiment was to identify what kinds of attributes and attribute levels associated with various forms of beef alliances would a cow-calf operator's decision making process.

Stated choice methods require an appropriate identification of attributes and the specification of feasible levels for the attributes. The attributes and their levels chosen must also be realistic in terms of whether or not they can actually be put into practice. Second, attributes have to be chosen carefully to avoid misinterpretation by respondents.

The choice experiment adopted in this study follows an unlabelled orthogonal main effects design with four attributes levels for each attribute. For an unlabelled experiment design, the choice alternatives are normally labeled as "Alternative A" and "Alternative B", such that the labels attached to each choice alternative convey no information beyond that provided by their attributes (Louviere et al. 2000). An orthogonal main effects design is used to reduce the total possible profiles in the survey questionnaire. In the choice experiment, as it is shown in detail below, a beef alliance is described by four attributes with four levels each. Thus, each scenario has a $(4\times4\times4\times4)$ factorial design, far too many to collect observations on each possible combination. Following Louviere, et al. (2000), if utility is assumed to be strictly additive with no interactions between attributes, only a " main effects plan" is required. The sample of profiles necessary are those where main effects are orthogonal to one another, and unobserved interactions are exactly correlated with one or more main effects (Louviere et al. 2000).

The beef alliance attributes were selected in two steps. First, the literature review generated a number of attributes that have been used in other beef studies. Second, the pilot survey was pre-tested with the help of government officials (Alberta Agriculture Food & Rural Development) and by using six cow-calf producers from Alberta.

The attributes selected to describe beef alliances in this study include sales type, production protocols, information sharing scheme and membership fee. These attributes and attributes levels are shown in **Table 4.01**.

1. Sales Type (marketing methods)

The attribute of sales type includes different combinations of marketing strategy adopted by cow-calf operations and a compensation scheme. The marketing strategies are direct sale to the alliance and retained ownership. The compensation scheme is a profit sharing scheme based on animal performance.

2. Information Sharing Scheme (data sharing)

As introduced in Chapter 2, the segmentation of the vertical beef production-marketing channel from cow-calf producers to the ultimate consumer potentially creates impediments to the efficient flow of information up and down the value chain. Alliances attempt to reduce segmentation by more formally linking stages in the vertical production-marketing channel through contracts and information sharing devices. Information sharing can improve incentives and management practices so as to produce animals that more accurately meet consumers' demands. By sharing information about products, markets, and market prices, the information flow can be more efficient as alliance participants can respond more quickly to changing market signals.

The attributes of information sharing schemes include live performance per pen or individual live performance data, and carcass data of a group of animals or individual carcass data. Live performance data per pen represents the status quo of information exchange adopted by current cattle auction markets. One the other side, the individual carcass data based on yield grade and quality grade implies adoption of grid pricing in a vertically coordinated beef supply chain.

3. Production Protocols and quantity commitment

Production commitments were considered as very important because they determine the quality control practices adopted by beef producers. In this study, the production commitments include production protocols and quantity commitments. Production protocols refer to the use of antibiotics and specific restriction of vaccination. Quantity commitment was represented by number of minimum cattle required by the beef alliance. According to Ward (2001), quantity commitment can be important in three ways. First, if an alliance is linked with a processing outlet, volume may be important to reduce costs. Second, if an alliance is targeting a specific branded product program, quantity commitments allow enhanced control over the supply of the product. Lastly, producers willing to make a quantity commitment to one outlet have an increased interest in the success of that outlet.

4. Membership Fee

In addition to the quantity commitment and formality commitment, the analysis of capital commitment also influences the stability of beef alliance. The analysis of capital requirement was based on monetary requirements for participation. Most alliances require some fee for producers to receive information about the cattle marketed. In order to gain insight into the effect that different membership fees have on a respondent's willingness to participate in a program, four levels of membership fees were included.

4.3.3 The Questionnaire

The questionnaire contains three parts. An example of the survey instrument is provided in **Appendix A**.

Questions in Part I focused on the respondent's view of the current beef industry. In this section, a series of question were asked concerning the marketing strategies and production practices adopted by the cow-calf operations. For example, in a question of "what did you do with your calf crop born in 2004?", respondent is required to allocate percentages across the options including sold as weaned calves, sold as preconditioned calves, retained ownership, and others. Some questions concerning the contractual arrangements used by cow-calf operations were also included. For example, the respondent was asked what kinds of factors are associated with the premium or discount of his cattle. Two ranking questions were included about the producers' evaluation of current beef auction markets. Respondents were asked to rank the performance of current regular auction and pre-sort auction markets in terms of achieving a competitive price, rewarding the qualities of cattle and professional livestock handling.

Questions in Part II focused on producers' willingness to participate in a beef alliance and a choice experiment. In traditional choice experiments, is common to include an opt-out alternative in each choice set (Bennett and Blamey 2001). In this way, the data can be analyzed via a standard multinomial logit model. It was expected that in the sample of this study there would be a number of respondents defined as non-participants who would not be willing to pay any specific investments (e.g., membership fee) for participating in a beef alliance. Since it is important to appropriately identify these non-participants, the opt-out alternative in multinomial choice experiment, however, does not distinguish between participants and non-participants. Therefore, non-participants were identified before respondents reached the choice experiment, hence only those respondents who were willing to participate in a beef alliance were asked to finish the choice experiment. Through this approach, both unconditional willingness-to-pay estimates (for the sample) and conditional willingness-to-pay estimates (i.e., for participants) can be derived (Carlsson and Kataria 2006), which can provide the policy-maker with additional information about how important the strategic alliance program is to the welfare of the participants.

Following this approach, Part II of the survey questionnaire only contains two questions. First, the respondent was asked to answer a binary choice question, "Will you want to participate in an alliance under certain circumstances?" While those respondents who answered "No" will get into the part III automatically, respondents who answer "Yes" will continue to do the following choice experiment. The choice experiment is to determine the producers' preferences for the attributes of beef alliances. A fractional factorial experiment was designed involving all possible combinations of the factor levels. Using statistical software ***SPSS*** version **14.0**, a reduced sample of 32 treatments was generated from the full fractional factorial experiment treatments. To avoid a lengthy questionnaire, the 32 questions were blocked into 8 sections, providing 4 questions on the choice of beef alliance per questionnaire. This resulted in 8 different versions of the questionnaire covering all 32 questions. **Table 4.02** is an example of version of choice experiment questionnaire.

Questions in part III asked for the respondent's demographic characteristics such as age, education, on farm or off farm income and beef cowherd size. In addition, respondents were asked about their expectation with regards to contract marketing.

4.3.4 Survey Procedure

The questionnaire was implemented in the spring of 2006 and the data for this thesis study were drawn from surveyed respondents across western provinces of Canada. In order to effectively collect data, both on-line administrated and computer-based, on-site interview survey instruments were facilitated by survey questionnaire software, Mod Survey version **3.2.3.** Altogether, 125 questionnaires were completed by producers, of which 51 questionnaires were completed on-line; the remaining 74 were completed via on-site interviews. Out of total 125 questionnaires completed, 110 questionnaires were finished as valid samples. This represents a response rate of 11.5% (i.e., totally 951 producers were asked to finish the survey.).

4.4 The Sample

4.4.1 General Demographic Information

1. Operation Type

The survey respondents represented a range of beef operations from seedstock to finishing operations. Some producers have mixed beef enterprises. Hence, respondents were asked to indicate their type of operation either as 1) cow- calf operation only; 2) cow-calf+ backgrounding; 3) cow-calf +backgrounding +finishing; 4) cow-calf + backgrounding +finishing + seedstock; 5) seedstock producer; 6) backgrouning only; 7) finishing only; 8) backgrounding + finishing. As shown in **Figure 4.01**, the majority of respondents (56%) belong to the category of cow-calf operation. About 25 percent of respondents are cow-calf + backgrounding operations while the remaining respondents belong to the categories of cow-calf +backgrounding + finishing (8%), cow-calf +backgrounding + finishing + seedstock (7%), backgrounding + finishing (1.8 %), seedstock (0.9 %) and finishing (0.9%). Out of the sample of this study, no one belongs exclusively to a backgrounding operation.

2. Beef Cowherd Size

Herd size is measured by the number of cows that beef producers have had at the end of 2005. The respondents were asked to choose from five categories to indicate their cowherd size as follows, 1) none; 2) less than 50 heads; 3) 51-150 heads; 4) 151-300 heads; 5) 300 and more. **Figure 4.02** indicates the distribution of cowherd size of respondents. About 7 percent of respondents indicated that they have no cows at the end of 2005. In the remaining respondents, about 36 percent had a herd of between 51- 150 heads, followed by respondents who had a cowherd size less than 50 heads (31%), respondents who had a cowherd size of between 151 -300 heads (19%), and about 6 percent of respondents indicated their cowherd size above 300 heads.

3. Operators' Experience with Beef Cattle Enterprise

The distribution of respondents in term of the number of years that they have been involved in the beef cattle farming is shown in **Table 4.03**. About 68 percent of respondents have 30 or fewer years of experiences in beef cattle operations. These respondents can be further categorized as having experience of less than 10 years (25.5%), 11-20 years (20%) and 21-30 years (22.7%). Approximately 18 percent of respondents have experience in beef cattle farming between 31 and 40 years. The remaining represented those producers that have 41-50 years (9.1%) and more than 50 years (4.6%) of experience in beef cattle farming. On average, respondents have about 24 years of experience in beef cattle farming.

4. Age

The respondents' actual age in years was not obtained from the survey. However, respondents were asked to indicate their age in five categories **(Table 4.04)**. **Figure 4.03** summarizes the age distribution of survey respondents. Almost 46 percent of the respondents were more than 50 years old (30% were between 51 and 60, and another 16% were over 60). Another 27 percent were between 41 and 50 years of age. About 28 percent of the producers responding were less than 40 (22% were under 30, and another 5.5% were between 31 and 40). The predominance of cattle producers close to retirement age suggests that the western Canadian cattle industry is facing a significant structural change.

It is interesting to explore the distribution of age classes across on-line or and on-site surveys. It was hypothesized that younger respondents would be more likely to choose an on-line survey rather than an on-site interview. As shown in **Figure 4.04**, 58.3 percent of respondents under the ages of 30 chose on-site interview. For those middle age respondents (between 31 and 40, and 41 and 50), their willingness to choose an on-line survey is higher than that to choose an on-site interview (66.7% and 53.3% respectively). For those elder respondents between 51 and 60, and those older than 60, their willingness to choose an on-site interview is much higher than that to choose an on-line version.

5. Education Level

Respondents' educational levels are categorized as three ways, 1) high school; 2) college;

and 3) university. **Figure 4.05** summarizes the education level distribution of survey respondents. About 54 percent of respondents have a high school diploma or equivalent. 28.2 percent of respondents have a college degree or are enrolled in a college degree program. The remainders are those respondents who have a university degree or equivalent. Education level is also supposed to influence the survey methodology adopted by a respondent. Higher degree in educational level implies a higher willingness to choose a more technical method to finish the survey. As shown in **Figure 4.06**, about 65 percent of respondents who have a university degree chose on-line survey, while only 33.9 percent of respondents who have a high school diploma chose on-line survey in this sample.

6. Income (Farm & off-farm income)

Respondents' incomes were measured by two sources, 1) farm income from beef; and 2) off-farm income. The descriptive statistics (**Figure 4.07**) shows that 52.7 percent of respondents indicated that their farm income from beef is more than 50% of their taxable farm income. Also, 35.5 percent of respondents indicated that their farm income from beef is less than 25% of their taxable farm income. The remaining respondents (11.82%) indicated that they had 25% - 50% farm income came from beef. The descriptive statistics (**Figure 4.08**) indicate the degree of a producer involved in beef production. About 36 percent of respondents did not answer this question. Of the remaining producers, about 27 percent of producers indicated that their annual off-farm income is less than 25 percent of the farm income. About 25 percent of producers indicated that their annual off-farm income is more than 50 percent of the farm income. Another about 11 percent of respondents indicated that the off-farm income is the percentage of between 25% and 50% of the farm income.

9. Off-farm Employment

In general, the beef cow-calf operation is suitable to small-scale and part-time farmers (Agricultural Research and Cooperative Extension at Pennsylvania State University 2001). Therefore, questions about the off-farm employment of beef producers and their partners were included in this study. Producers were asked to indicate if they or their beef business partners have off-farm employment. Furthermore, they were also asked to indicate the characteristics of their off-farm employment, that is, part-time or full-time. As shown in **Table 4.05** and **Table 4.06**, out of total 110 respondents of the sample size, the majority (69.9%) of respondents have no off-farm employment. However, their partners in beef business have a higher rate (50%) to work in off-farm business. **Table 4.07** presents the descriptive statistics of characteristics of their off-farm employment. Only 26 respondents indicated that their off-farm employment is full-time, which represents 23.6 percent of the sample size. Further, only 18 respondents indicated that their partners are doing a full-time off-farm business, which represents 16.4 percent of the sample size.

4.4.2 Alternative Marketing and Production Practice

Beef cattle producers' attitudes towards alternative marketing arrangements were analyzed based on the selling of weaned calves, the perception of current marketing channels (auction market), the use of perspective contractual arrangements and marketing agreements (alliance), and the use of information concerning cattle marketing and production.

1. Alternative Marketing Strategies to Handle the Calf Crops in 2004

As shown in **Figure 4.09**, 80 percent of respondents indicated that they sold their calf crops in 2004 as weaned calves. About 40 percent of beef producers indicated that they retained ownership in 2004. 50 percent of respondents indicated that they handled their calf crops as replacement heifers. The remaining is belonging to "sold as preconditioned calves" (19.1%) and others use (16.4%). The other alternative marketing strategies included "backgrounding the light calves", "slaughtered for personal use", etc.

Using a ranking technique, respondents were asked to indicate their most preferred marketing strategy through which they handle their weaned calves in 2005. Based on the descriptive statistics of marketing channels through which producers sold most heads (**Figure 4.10**), about 59 percent of respondents indicated that selling weaned calves through auction markets is their most frequently used marketing strategies. The next followings are “retained ownership” (13.6%), “others[6]” (5.5%), “directly sells to backgrounder” (4.6%), and “directly to feeders” (2.7%).

2. Perception of Current Auction Market

Producers were also asked to indicate the level of satisfaction they derived from the auction market (regular and pre-sort) on a scale of 1-5 where 1 is “ they performed extremely well”, 2 is “ very well”, 3 is “ quite well”, 4 is “ not very well”, and 5 is “ extremely poor”[7]. Respondents were asked to evaluate the performance of current auction markets in terms of achieving a competitive price, in terms of rewarding the qualities of cattle and in terms of professional livestock handling. The descriptive statistics are reported as shown in **Figure 4.11** and **Figure 4.12**.

In terms of achieving competitive price in current regular auction market, those indicated “very well” represent 32.7 percent of survey respondents. About 26 percent of respondents indicated that current regular auction market performs “quite well”. 18.2 percent of producers indicated that it performs “extremely well”. Only 5.5 percent of respondents answered “not very well”.

In terms of rewarding the qualities of cattle in current regular auction market, those indicated “quite well” represent 29 percent of survey respondents. About 27 percent of respondents indicated that current regular auction market performs “very well”. Another 26.4 percent of producers indicated that it performs “extremely well”. Only 6.4 percent and 5.5 percent of respondents answered “not very well” and “extremely poor” respectively.

In terms of professional livestock handling in current regular auction market, those indicated “very well” represent 29 percent of survey respondents. About 27 percent of respondents indicated that current regular auction market performs “quite well”. Another 20 percent of producers indicated that it performs “extremely well”. Only 2.7 percent and 1.8 percent of respondents answered “not very well” and “extremely poor” respectively.

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[6] “Others” includes “private treatment”, “directly to an order buyer”, and “other marketing agreement”.

[7] See footnote 16.

The descriptive statistics of pre-sort auction markets are similar to that of regular auction markets (**Figure 4.12**). However, about 48 percent of respondents answered they never used pre-sort auction market. This implies that the more quality-control oriented marketing strategy is not very popularly adopted by beef producers.

3. Experience of Retained Ownership

From the above, retained ownership is the second most popular marketing strategy adopted by beef producers in the sample of this study. Retained ownership of cattle can be either to backgrounding or to the slaughter stage (processing). In order to explore the experience of using retained ownership strategy, the respondents were asked whether they retained ownership to backgrounding or slaughter in the past years. **Figure 4.13** shows that 44.6 percent of respondents indicated that they never retained ownership to backgrounding before. Of the remaining respondents, about 45 percent of producers once retained ownership to backgrounding but fed the cattle on their own farm. About 3 percent of those remaining producers have experienced retaining ownership to backgrounding using custom feeding. Further, 7.3 percent of respondents used a mixed feeding program either on their own farm or in a custom feeding establishment. With regard to those respondents who answered the question about the experience of retaining ownership of cattle to slaughter (i.e., 64 respondents answered this question), 56.2 percent of the respondents have retained ownership of cattle until slaughter, and 43.8 percent of producers never retained ownership of cattle until slaughter (**Figure 4.14**).

In a hypothetical scenario of retained ownership of cattle to backgrounding, 63.9 percent of respondents indicated that an average price based on regional auction markets should be used in determining the final price in dealing with their buyers. When producers are assumed to retain ownership to slaughter, only 38.9 percent of respondents had the positive answer (**Figure 4.15**). In another hypothetical scenario of retained ownership of cattle to backgrounding, about 32 percent of producers indicated that there should be premiums (discounts) for meeting (not meeting) specified characteristics in cattle sold. Similarly, when producers are assumed to retain ownership to slaughter, only 19 percent of respondents presented the positive answer (**Figure 4.16**). Furthermore, the respondents were asked to indicate the factors that determine the premiums and discounts either when retained ownership to backgrounding or when retained ownership of cattle to slaughter. In the first scenario (retained ownership to backgrounding), out of total 110 respondents, about 64 percent of respondents did not answer this question. Among the remaining respondents, about 21 percent of respondents indicated that these premiums (discounts) are associated with the breed of cattle. About 9 percent of the respondents indicated that a regional average price is directly factored into the payment scheme. Another 14.6 percent of respondents indicated that other quality-related specifications are associated with the premiums (discounts) including reputation, brand, condition, weight, and so on (**Figure 4.17**).

In the second scenario analysis in which producers were hypothesized to retain ownership to slaughter, about 76 percent of respondents did not answer this question (**Figure 4.18**). About 13 percent of respondents indicated that quality is the primary reason that determines the premiums (discounts), followed by yield grade (11.2%), regional average price (10.9%), discount scales apply for carcass over (lbs) (9.1%), and other specifications related to carcass weight such as breed (5.5%).

4. Experience of Using Marketing Contracts and Agreement

Producers were asked about their experience of using contractual arrangements in 2005. **Figure 4.19** indicates that 38.2 percent of respondents use informal agreements, and only 12.7 percent of producers use formal contractual agreements. The remaining indicated that they never used contracts or agreement before.

The survey also explored the producers' experience of using pre-specified pricing contracts (i.e., future and forward contracts), and custom feeding contracts in cattle marketing. As shown in **Figure 4.20**, only 8.2 percent of producers have used either future or forward contracts. The respondents who have experience of using future contracts in weaned calves marketing are even less (3.6%). Compared with pre-specified pricing contracts, custom feeding contracts are more popular. About 49 percent of producers used custom feeding contracts before, of which 41.8 percent of producers used oral contracts while 9.1 percent of producers used written contracts.

5. Perspective of Information Management

Producers were asked to indicate what types of information they use in the cattle farming. Four types of information data concerning the cattle production were listed, 1) market data; 2) production data; 3) cost of production data; 4) processing data. As shown in **Figure 4.21**, market data includes auction price information and contracts information. Production data includes 6 sub-categories concerning the production of cattle such as genetics, birth weights and birth rates. Cost of production data includes transaction cost, production cost such as feed costs, grazing cost and operating costs, etc. As shown in **Figure 4.22**, approximately 82 percent of respondents indicated that they use market data, of which the majority (76.4%) is interested in auction price information. However, only 29.1 percent of respondents use information on contracts such as pricing scheme and custom feeding agreement specifications. Further, 27.3 percent of producers indicated that they use production data, such as birth weights and genetics (**Figure 4.23**), and 69 percent of respondents indicated that they use information on cost of production (**Figure 4.24**).

The survey also explores the ways in which producers use the information on production and marketing. As shown in **Figure 4.25**, almost half (45.5%) of respondents prefer storing the information concerning the beef and cattle production and marketing, without actually using it further. For those producers that indicated that they use the information actively, the following options were available to them: 1) internally using information; 2) using information on feeding program; 3) using information on breeding program; 4) using information on business management; and 5) using information on health program. About 42 percent of producers use the above information internally, without any outside advice. Further, the frequency of using this information is distributed as following: information on feeding programs (24 percent); information on breeding (17.3%), business management (19.1%) and health program (26.4%).

Producers were also asked how many publications that related to cattle production and marketing they subscribed to. As shown in **Figure 4.26**, 30.9% of producers did not subscribe to any such publication. Of those who had subscribed to a publication, 14.6%

had one publication, 16.4 % had subscribed to two publications (16.4%), and 17% had subscribed to 3 publications.

6. Beef Alliance Participation & Choice Experiment

When asked about their willingness to participate, in principal, in a beef alliance, the majority (76.4%) of respondents answered "yes" (**Figure 4.27**). Those respondents were automatically channeled to the choice experiment questionnaire. As discussed above, the choice experiment is blocked into eight versions with 4 choice sets each. Therefore, each respondent only needs to answer 1 version with 4 choice sets. The descriptive statistics of these eight versions is reported in **Table 4.08**. As can be seen from **Table 4.08**, the respondents are almost evenly distributed across these eight versions, affirming that the randomized generation procedure actually worked.

7. Beef Specialization

Respondents were asked to indicate if they specialized in a particular breed of cattle. As shown in Figure 4.2**8**, 55.4 percent answered "no". With regards to the specialized breed, the majority of producers focused on a certain breed such as Red or Black Angus, while others specialized in cross breeds (e.g., Simmental, cross Angus).

8. Diversified Production

Respondents were asked to indicate whether they have farm activities other than beef (Figure **4.29**). Out of the total of 110 respondents, 25.5 percent indicated that their farm activities are limited to beef production. The remaining respondents (74.6%) answered that they have other important farm activities, which include hay, grain for feed, horse, pork, and so on.

4.4.3 Operations' Expectation for the Future Beef Industry

1. Expectation for Production Protocols in the Future

Respondents were asked to indicate if they expect the buyers to require the calves to meet specific production protocols. As shown in **Figure 4.30**, the majority (79.1 percent) expect that such production protocols will be required in the future.

2. Perceptions on Price Variability of Replacement Cow

Respondents were asked to indicate how market prices for bred cows will move when replacement cow prices are very low. They were provided 7 choices of price variability as follows, 1) 1 year; 2) 2 year; 3) 3 year; 4) 4 year; 5) prices change too much to determine a length of time; 6) never; and 7) other. **Figure 4.31** presents the descriptive statistics of this question. Out of total 110 respondents, 30 percent of respondents indicated that the price variability cannot be determined, followed by 4 years (23.6%), 3 years (13.6%),1year (6.4%), never(3.6%), 7 years (3.6%), and 10 years(0.9%). In the comments section to this question, 10 percent of respondents indicated that, in their view, future uncertainty include market risk and disaster (e.g., BSE) as the main factors that determine the price variability in the long run.

3. Expectation for Net Income in 2007 from Beef Operations and Market Value of Cows in 2007

Respondents were asked to indicate their expectation about their net income from beef in 2007, and the market value of their beef cows in 2007. Out of the total of 110 respondents, 55.45 percent indicated that their net income from beef in 2007 is extremely unlikely to be above their average net income. The respondents indicated that on average, the net income in 2007 is 12.73 percent above the average net income. About 45 percent of respondents indicated that their net income from beef operation in 2007 is extremely unlikely to be below their average net income. The respondents indicated that on average, the net income in 2007 is 11.2 percent below the average net income.

With regard to the market value of their beef cows, 47.3 percent of respondents indicated that market value of their beef cows in 2007 is extremely unlikely to be above the long term average value. The respondents indicated that on average, the net income in 2007 is 12 percent above the average net income. 46.4 percent of respondents indicated that market value of their beef cows in 2007 is extremely unlikely below the long term average value. The respondents indicated that on average, the net income in 2007 is 11.4 percent below the average net income.

4.4.4 Comparison of Sample, Previous Study, and Canadian Census of Agriculture Data

In order to examine whether this sample is the representative of the overall population, a comparison of the cow-calf operator survey population to the farm operator population represented in the 2001 Canadian Census of Agriculture is provided in **Table 4.10**[8]. It is worth emphasizing that, with regard to some specific profiles of respondents collected in this sample, there is no comparable information available through the Census of Agriculture data (e.g., farm income from beef). Therefore, the survey sample did not follow Statistics Canada's Census of Agriculture data closely.

Compared with the 2001 Census of Agriculture and Brocklebank and Hobbs (2004), this sample has a higher beef cowherd size. It is not very surprising as the samples are collected primarily from Alberta, which is the largest beef production province in Canada. The sample also has a higher education attainment than the average, as indicated by the 2001 census data. The sample is younger than the average but slightly older than that in Brocklebank and Hobbs (2004). Although the ability to generalize from the results of this study is limited by the fact that this sample is not fully representative, it is still desirable to examine the current sample of producers' attitude. If the attributes of beef alliances considered are important for the producers in a specific sample, then the results can be still used to determine if they hold for a more representative sample (Hudson and Lusk 2004).

4.5 Summary and Conclusions

This chapter has presented the survey instrument development and the descriptive statistics. From the literature review and in conjunction with industry representatives, sales type, information sharing scheme, production protocols and membership fee were selected as the attributes of a choice experiment on beef alliances. Both qualitative and quantitative levels were incorporated into an unlabelled experiment design. An orthogonal-designed experiment was generated to formulate the central part of the survey questionnaire. Other questions concerning the producers' attitudes toward marketing arrangement, risk perception and social-economic demographic were developed in the final survey questionnaire as a supplemental information to analyze the alignment problems existed in current beef industry. The descriptive statistics were presented as a basis of further econometrical estimation. The next chapter will present an analysis of the data of the choice experiment.

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[8] To examine the regional difference, the counterpart analysis presented in Brocklebank and Hobbs (2004) is also incorporated into the Table 4.10.

4.6 Appendix: Tables and Figures

Table 4.01 Attributes and Attributes Levels of Choice Experiment

Beef Alliance Attributes	Level 1	Level 2	Level 3	Level 4
Sale Type	Sell to alliance, NO profit sharing	Sell to alliance, bonuses based on animal performance	Retain ownership, NO profit sharing	Retain ownership, profit sharing
Information Sharing Scheme	live performance, pen	live performance, individual data	Carcass, group data	carcass, individual yield & grade data
Production Protocols	NO restrictions on vaccination and use of antibiotics & NO min. number of animals required	NO restrictions on vaccination and use of antibiotics & min. number of animals required	Restrictions on vaccination and use of antibiotics & NO min. number of animals required	Restrictions on vaccination and use of antibiotics & min. number of animals required
Membership Fee	$0	$5	$10	$20

Table 4.02 Example of Choice Experiment

Attributes	Alliance A	Alliance B
Sale Type	Sell to alliance, bonuses based on animal performance	Sell to alliance, No profit sharing
Information Sharing Scheme	live performance, individual data	live performance, individual data
Production Protocol	Restrictions on vaccination and use of antibiotics & No min. number of animals Required	Restrictions on vaccination and use of antibiotics & min. number of animals Required
Membership Fee	$0	$5

Table 4.03 Operators' Experiences in Beef and Cattle Farming

Years	**No. of Producers**	**Percent**	**Cumulative %**
1-10	28	25.45	25.45
11-20	22	20.00	45.45
21-30	25	22.73	68.18
31-40	20	18.18	86.36
41-50	10	9.09	95.45
>50	5	4.55	100.00

Table 4.04 Ages of Respondents (No. = 110)

Description	Frequency	Percent	Cumulative %
Under 30	24	21.82	21.82
31-40	6	5.45	27.27
41-50	30	27.27	54.55
51-60	33	30.00	84.55
61 and older	17	15.45	100.00
Total	110	100.00	

Table 4.05 Off-farm Employment: Myself (No. = 110)

Description	Frequency	Percent	Cumulative Percent
No	67	60.91	60.91
Yes	43	39.09	100.00
Total	110	100.00	

Table 4.06 Off-farm Employment: My Partner (No. = 110)

Description	Frequency	Percent	Cumulative Percent
No	50	45.45	45.45
Yes	50	45.45	90.91
Not Applicable	10	9.09	100.00
Total	110	100.00	

Table 4.07 Off-farm Employment: Full-time vs. Part-time (No. = 110)

Description	Frequency	Percent	Cumulative Percent	Frequency	Percent	Cumulative Percent
	Myself			My Partner		
No Responses	38	34.55	34.55	38	34.55	34.55
No	19	17.27	51.82	32	29.09	63.64
Yes	26	23.64	75.45	18	16.36	80.00
Not Applicable	27	24.55	100.00	22	20.00	100.00
Total	110	100.00		110	100.00	

Table 4.08 Frequency Tables of Versions of Choice Experiment (No. = 84)

Description	Code	Frequency	Percent	Cumulative Percent
Version 1	1	8.00	7.27	30.91
Version 2	2	12.00	10.91	41.82
Version 3	3	15.00	13.64	55.45
Version 4	4	14.00	12.73	68.18
Version 5	5	8.00	7.27	75.45
Version 6	6	7.00	6.36	81.82
Version 7	7	9.00	8.18	90.00
Version 8	8	11.00	10.00	100.00
Total	Total	84.00	100.00	

Table 4.09 Expectations for Net Income from Beef Operation in 2007 and Market Value of Cows in 2007

Descriptions	N	Response Rate	Minimum	Maximum	Mean	Std. Deviation
extremely unlikely % above average net income	110	55.45	0.00	100.00	12.73	19.73
extremely unlikely % below average net income	110	44.55	0.00	100.00	11.19	19.98
extremely unlikely % above long term average value of cows	110	47.27	0.00	100.00	12.27	21.05
extremely unlikely % below long term average value of cows	110	46.36	0.00	95.00	11.36	18.58
Total	110					

Table 4.10 Comparison of the Sample, Previous Study and Canadian Census of Agriculture Data

	Percentage in Category		
	Census of Agriculture (2001)	Brocklebank and Hobbs (2004)	Cow-calf operator Survey (This study)
Gross Revenues ('000' s)			
0-10	21.00%	6.00%	No Comparable Data Available
10-49	29.00%	11.00%	
50-99	14.00%	16.00%	
100-249	20.00%	30.00%	
250-499	10.00%	23.00%	
500+	6.00%	14.00%	
Farm Income from Beef			
Less than 25%	No Comparable Data Available	No Comparable Data Available	35.45%
Between 25% and 50%			11.82%
More than 50%			52.73%
Alliance Participation			
Yes	No Comparable Data Available	15.00%	76.36%
No		85.00%	23.64%
Herd Size			
0-50	Avg. Canadian Herd Size: 53 Head; Avg. Western Canadian Herd Size: 67 Head	20.00%	38.18%
50-100		18.00%	36.36%
100-150		20.00%	
150-200		21.00%	19.09%
200-300		10.00%	
300+		11.00%	6.36%
Education[9]			
High School	62.00%	29.00%	53.64%
College	27.00%	27.00%	28.18%
University	11.00%	11.00%	18.18%
Age[10]			
Less than 35	11.50%	35.00%	21.82%
35-60	53.60%	62.00%	62.72%
60+	34.90%	3.00%	15.45%

Source: Statistics Canada & Borcklebank and Hobbs (2004)

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[9] The Census of Agriculture (2001) uses categories of "less than grade 9"; "grade 9-12"; 'post secondary (non-university"; and "post secondary (university)".

[10] The survey used in this study categories age of respondents as " under 30"; "31-40"; "41-50"; "51-60" and "60+".

Figure 4.01 Operation Type (No. =110)

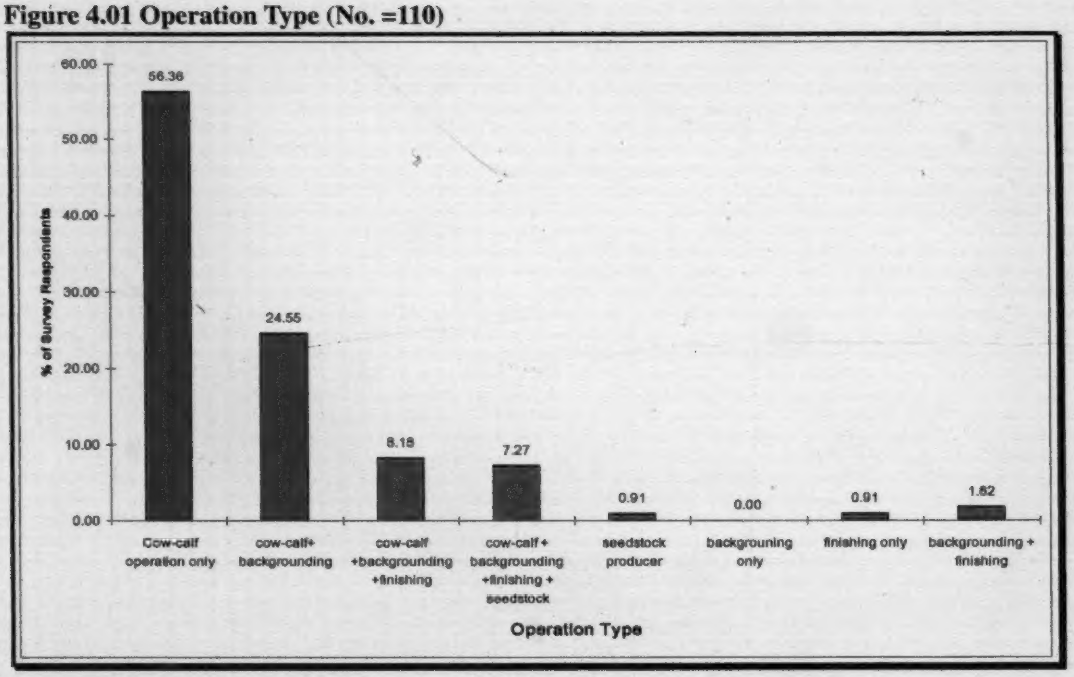


Figure 4.02 Cowherd Size (No. =110)

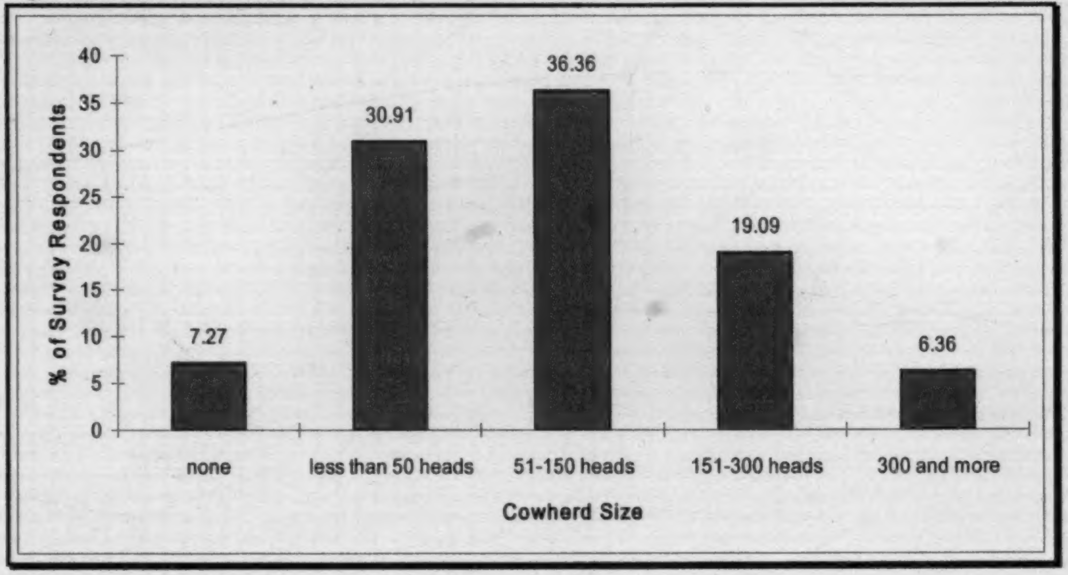


Figure 4.03 Ages of Respondents (No. =110)

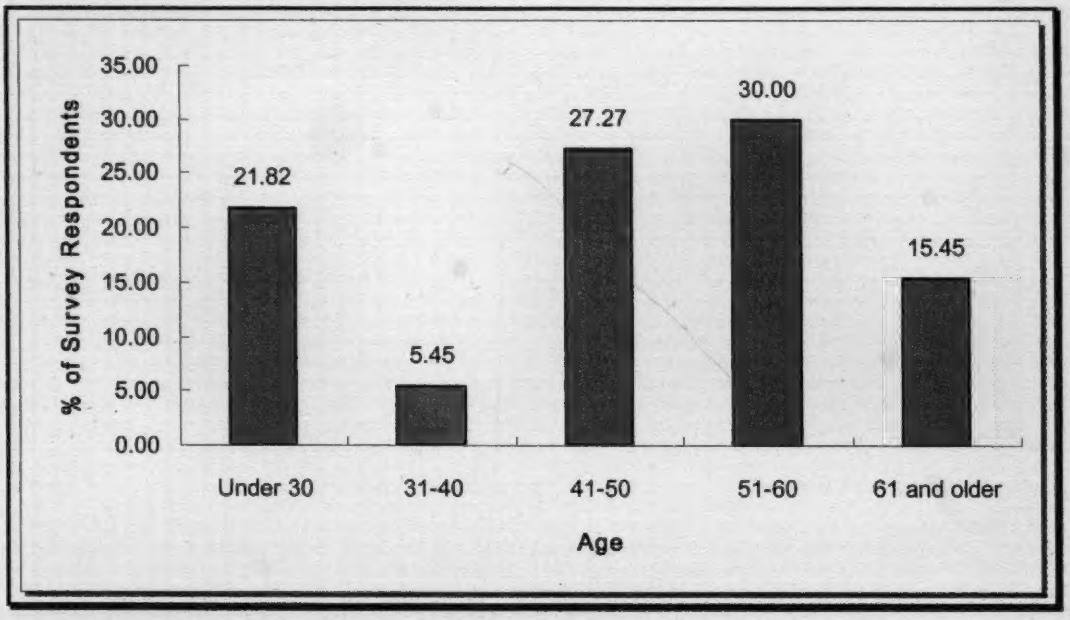


Figure 4.04 Ages of Respondents: on-line sample vs. on-site sample (No. =110)

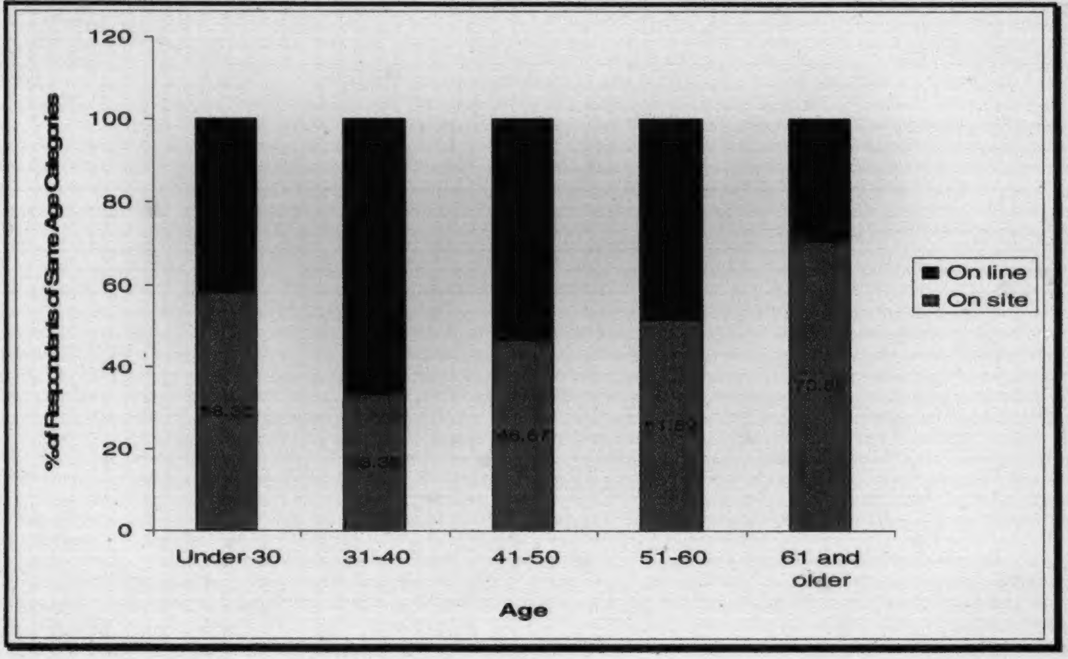


Figure 4.05 Education Levels of Respondents (No. =110)

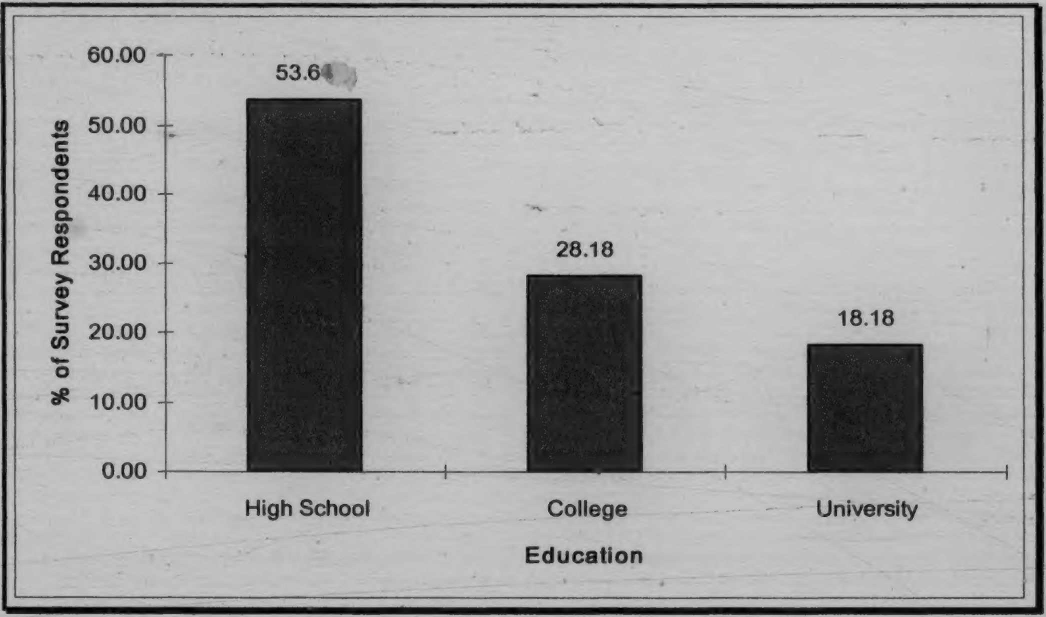


Figure 4.06 Educational Level of Respondents: on-line sample vs. on-site sample (No. =110)

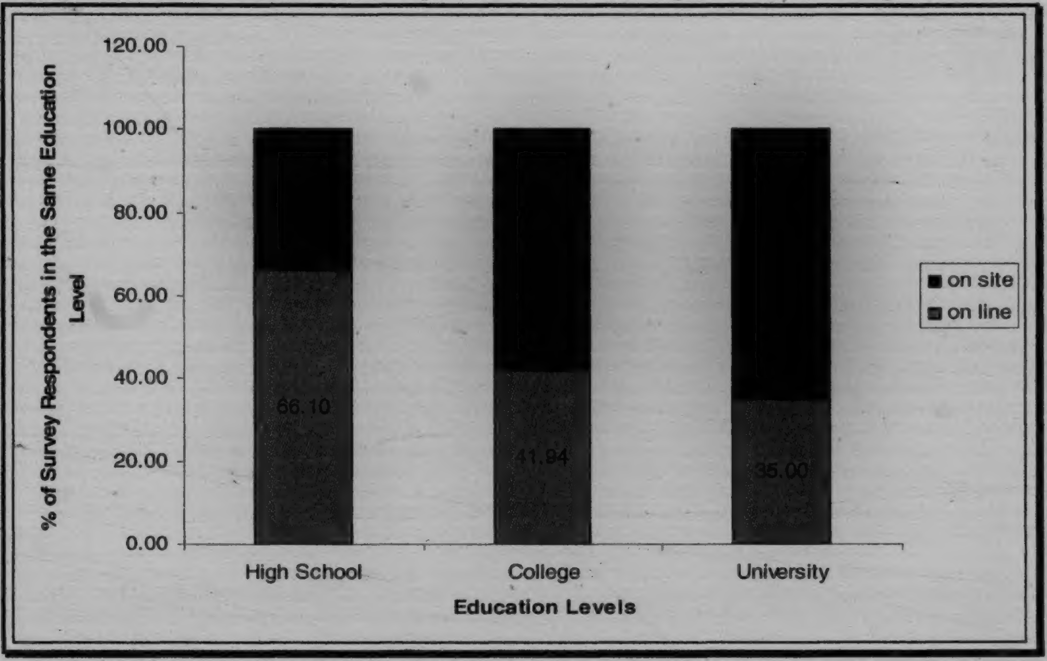


Figure 4.07 Farm Incomes from Beef of Respondents (No. =110)

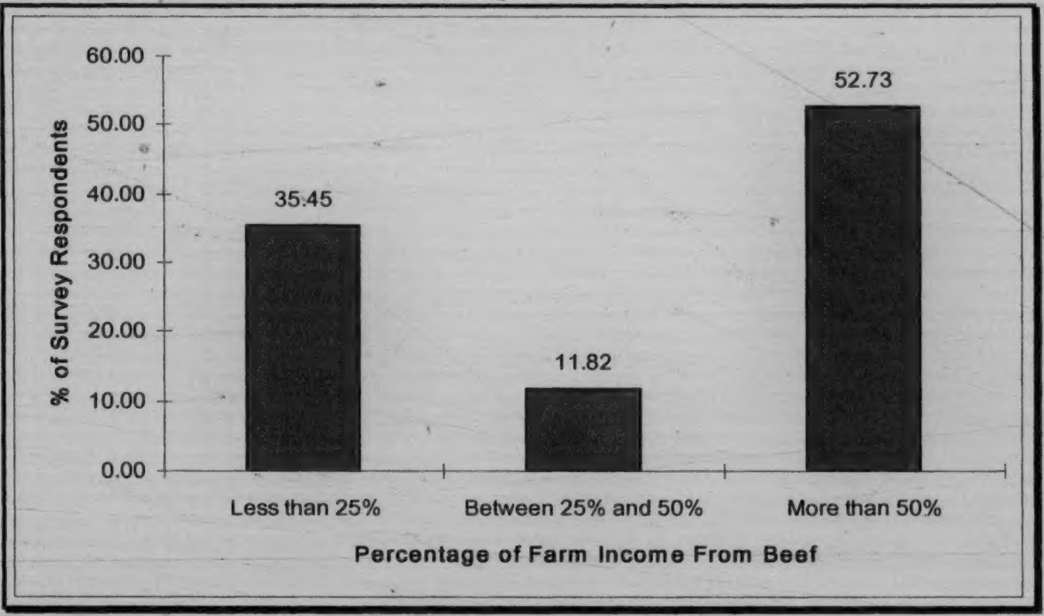


Figure 4.08 Off-farm Income of Respondents (No. =110)

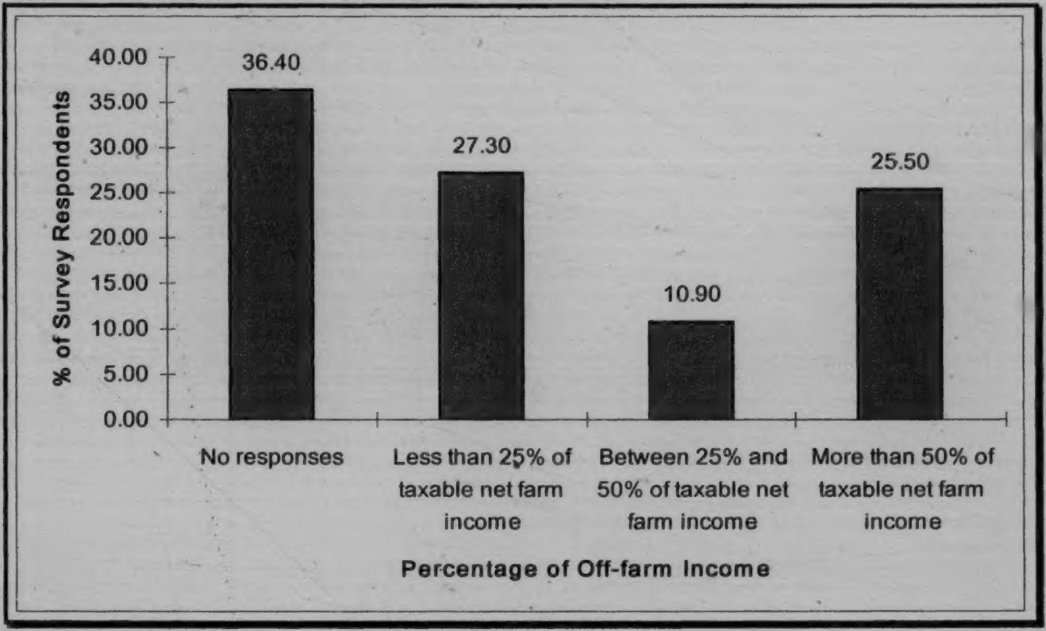


Figure 4.09 Marketing Strategies of Handling with Calf Crop (No. =110)

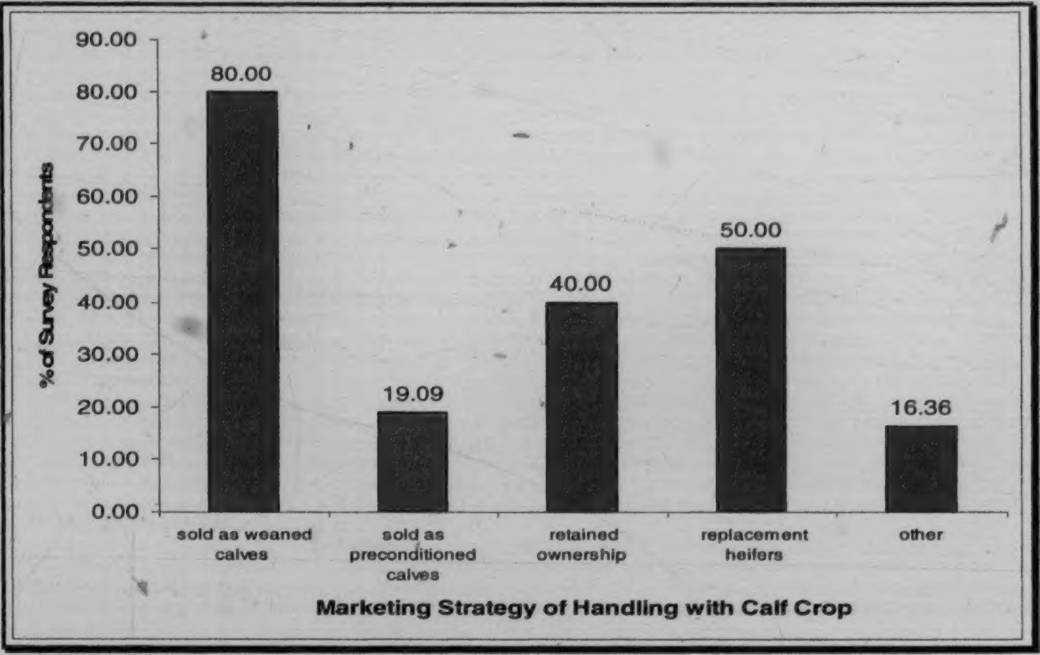


Figure 4.10 Marketing Strategies of Weaned Calves (No. =110)

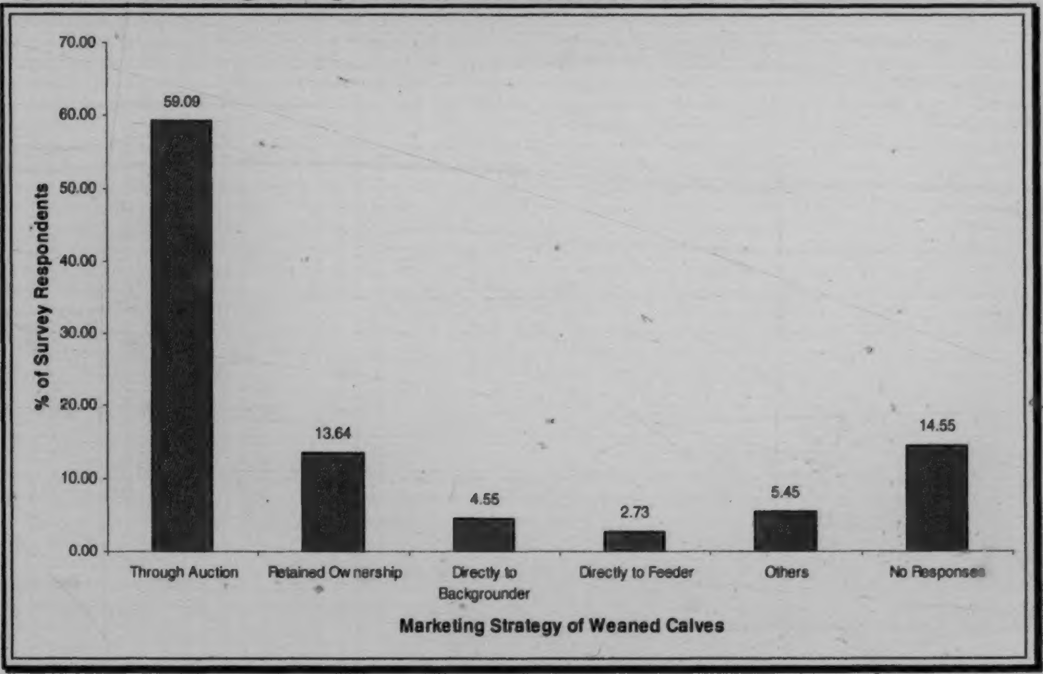


Figure 4.11 Respondents' Perceptions of Performance of Regular Auction Market (No, =110)

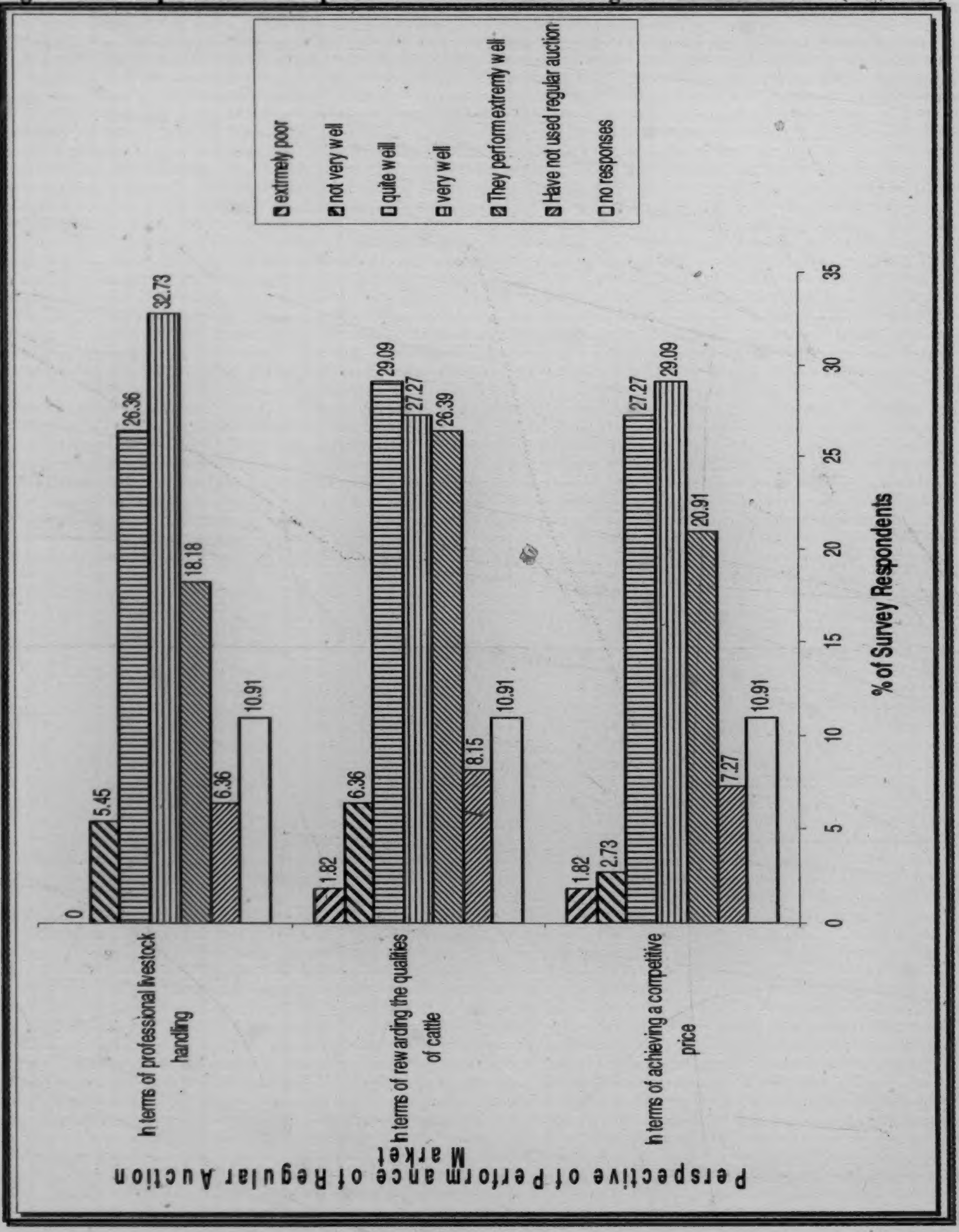


Figure 4.12 Respondents' Perceptions of Performance of Pre-sort Auction Market (No. =110)

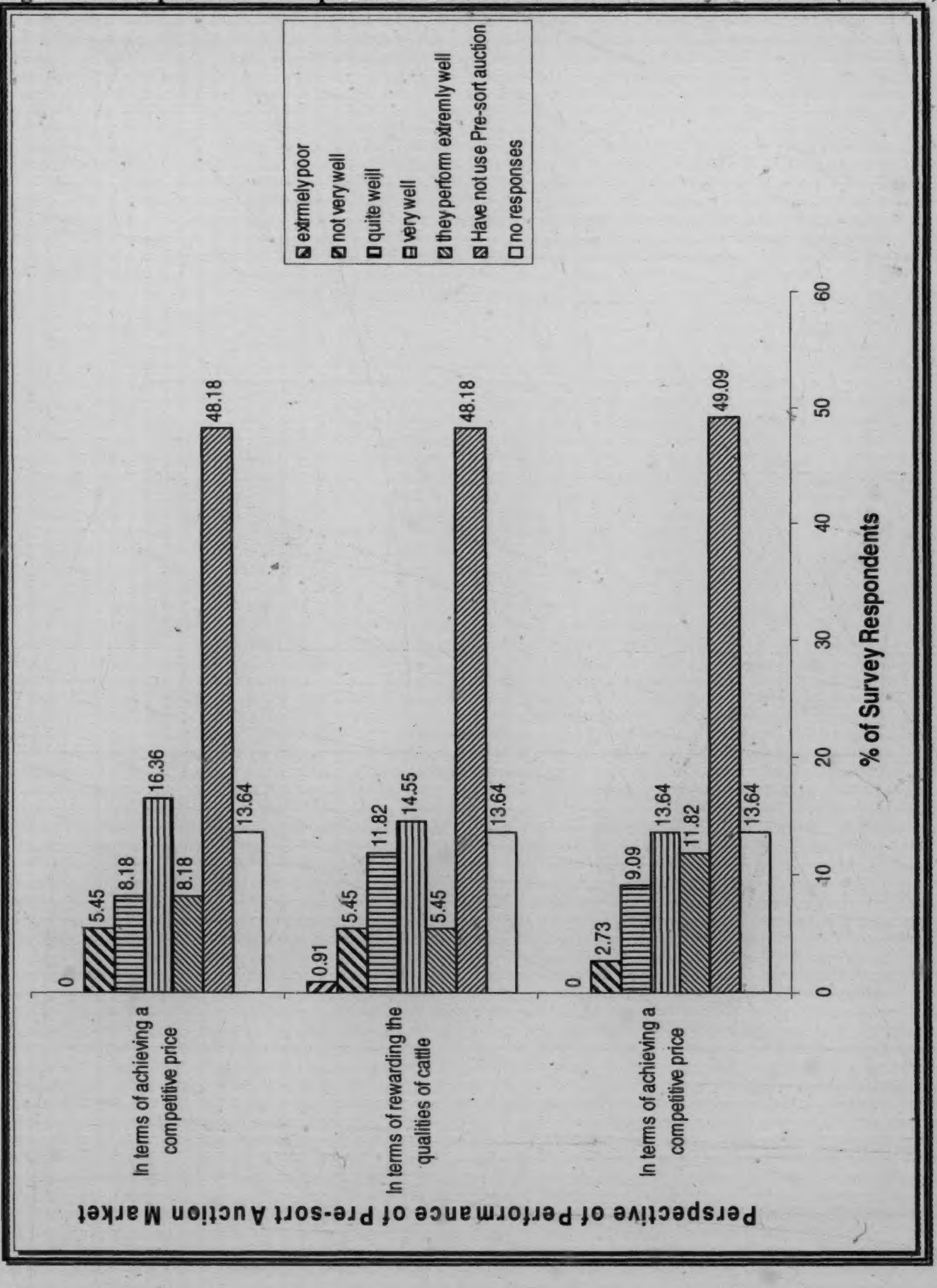


Figure 4.13 Experience of Retaining Ownership of Cattle to Backgrounding (No. =110)

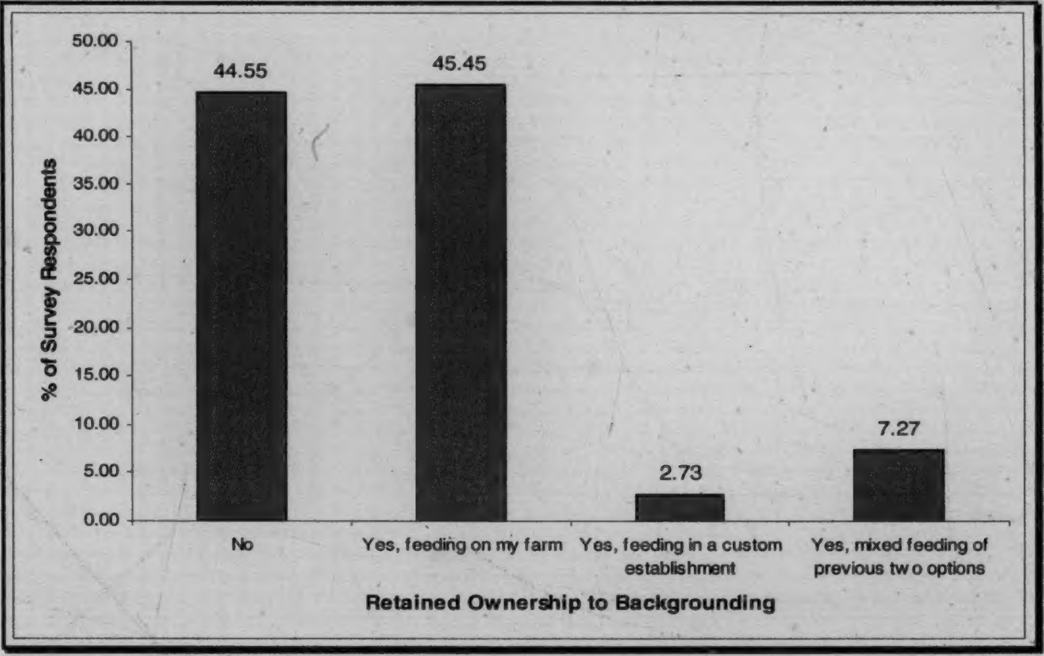


Figure 4.14 Experience of Retaining Ownership of Cattle to Slaughter (No. =64)

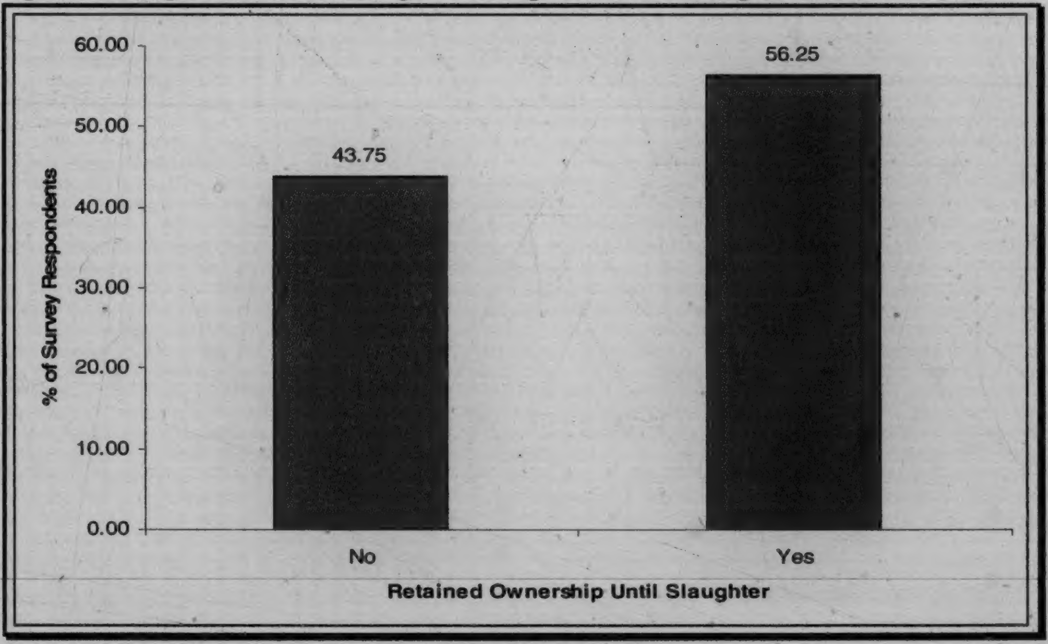


Figure 4.15 Final Price of Transaction When Retained Ownership ((No. =61(i.e., Retained ownership until backgrounding); No.=36 (i.e., Retained ownership until slaughter))

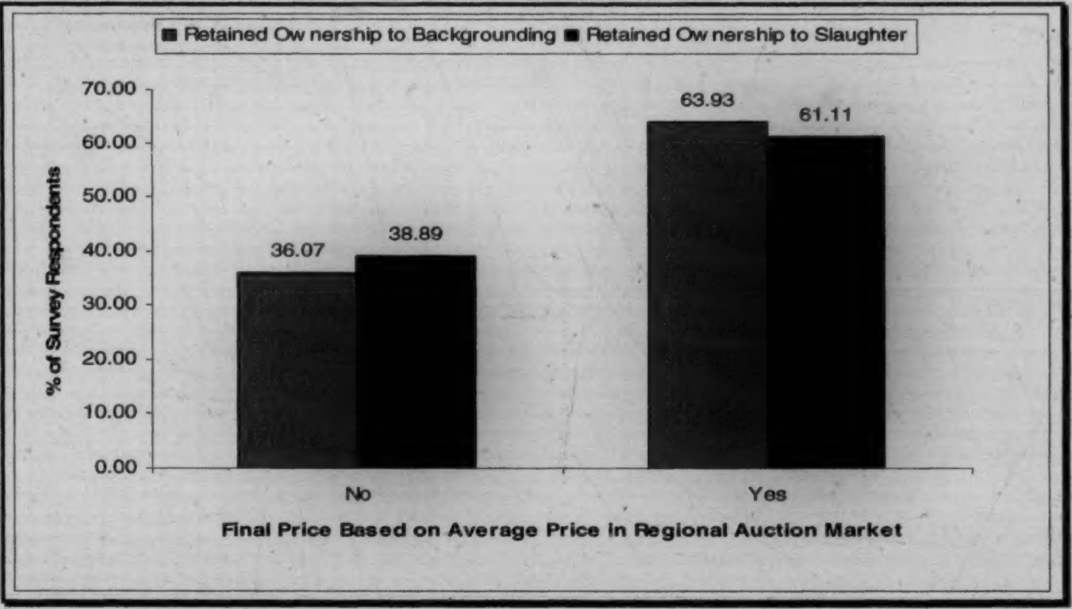


Figure 4.16 Existence of Premiums/Discounts When Retained Ownership (No. =61(i.e., Retained ownership until backgrounding); No.=36 (i.e., Retained ownership until slaughter))

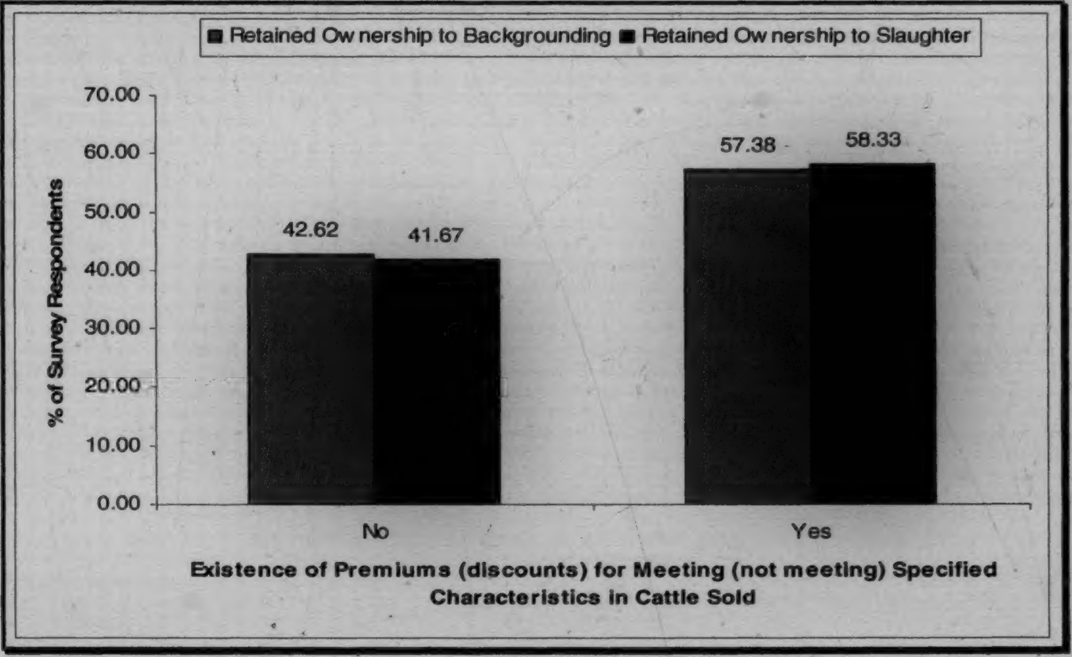


Figure 4.17 Factors Determining the Premiums/Discounts When Retained Ownership to Backgrounding (No. =49)

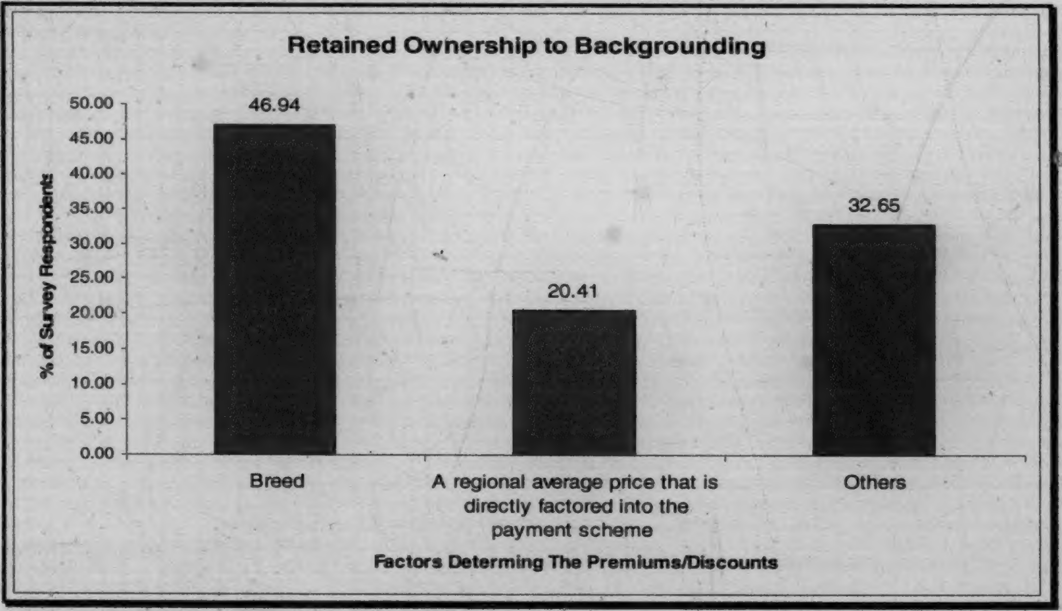


Figure 4.18 Factors Determining the Premiums / Discounts When Retained Ownership to Slaughter (No. =55)

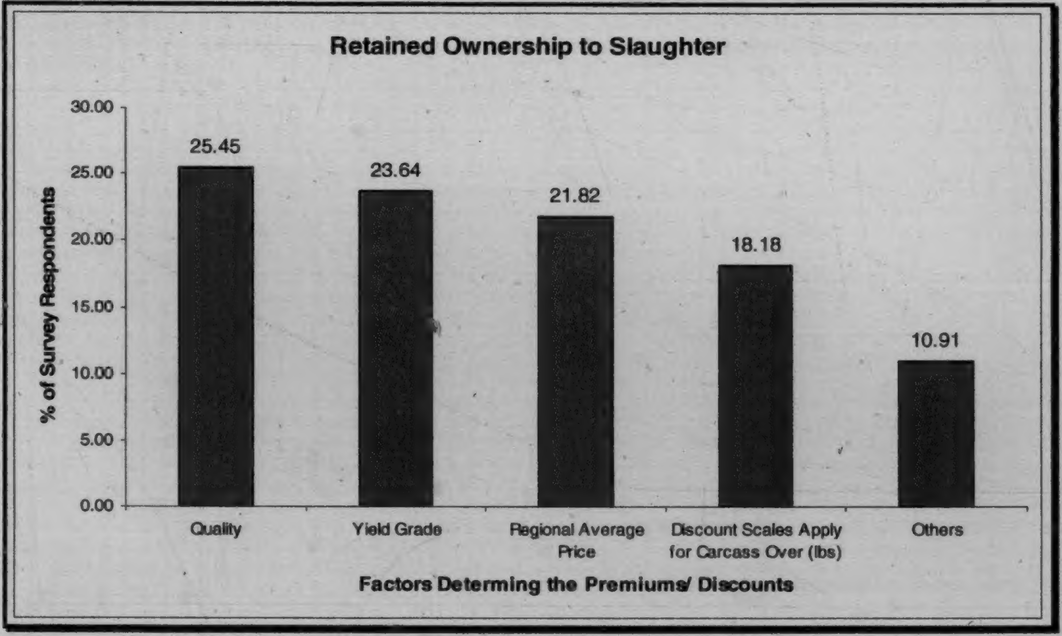


Figure 4.19 Experiences of Using Contracts (No. =110)

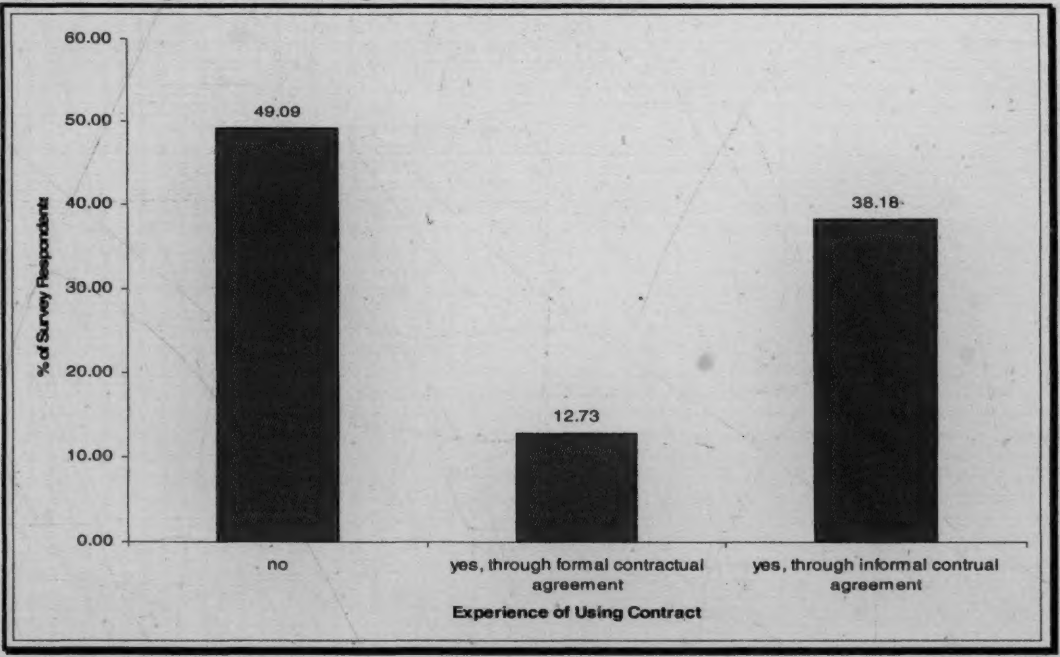


Figure 4.20 Experiences of Using Forward Contracts, Future and Custom Feeding Contracts (No. =110)

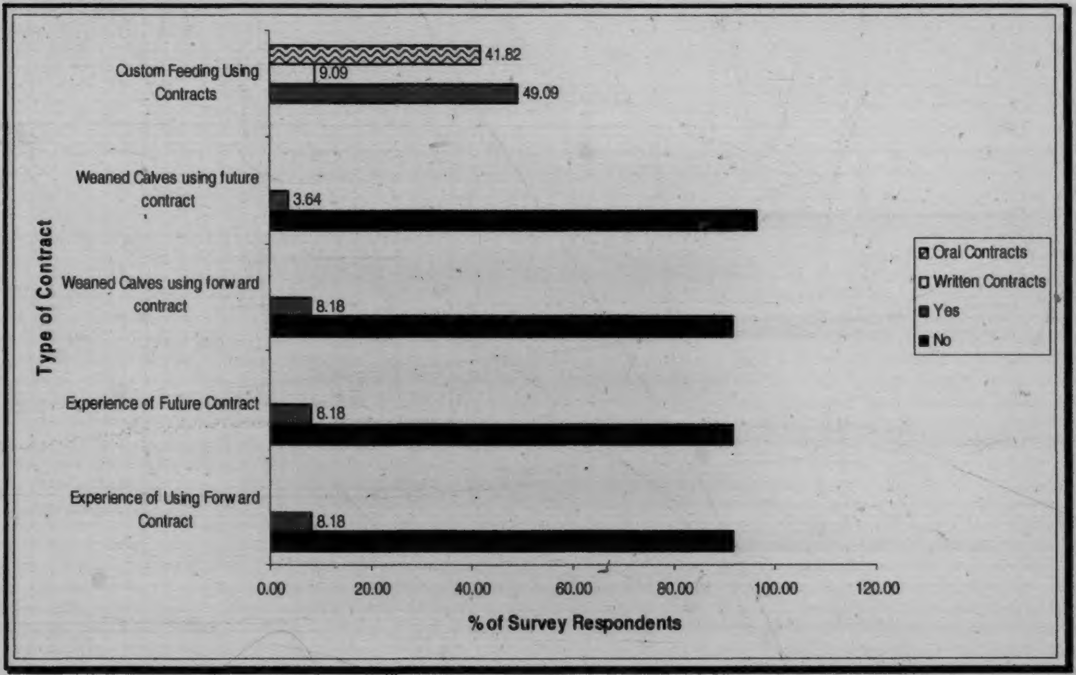


Figure 4.21 Types of Information Needed in Cattle Production and Marketing (No. =110)

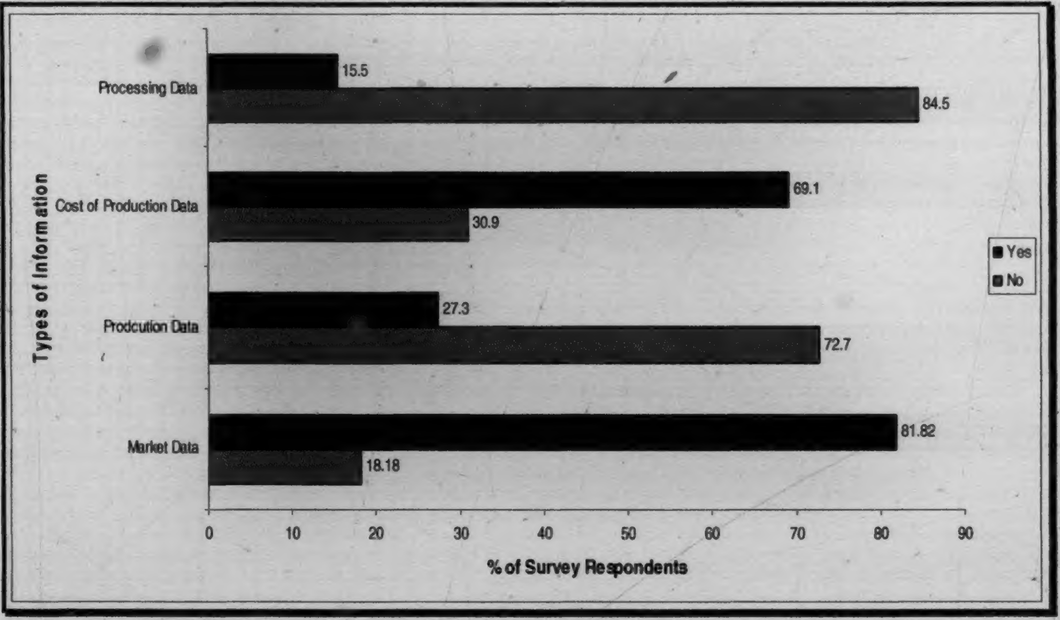


Figure 4.22 Market Information Needed in Cattle Production and Marketing (No. =110)

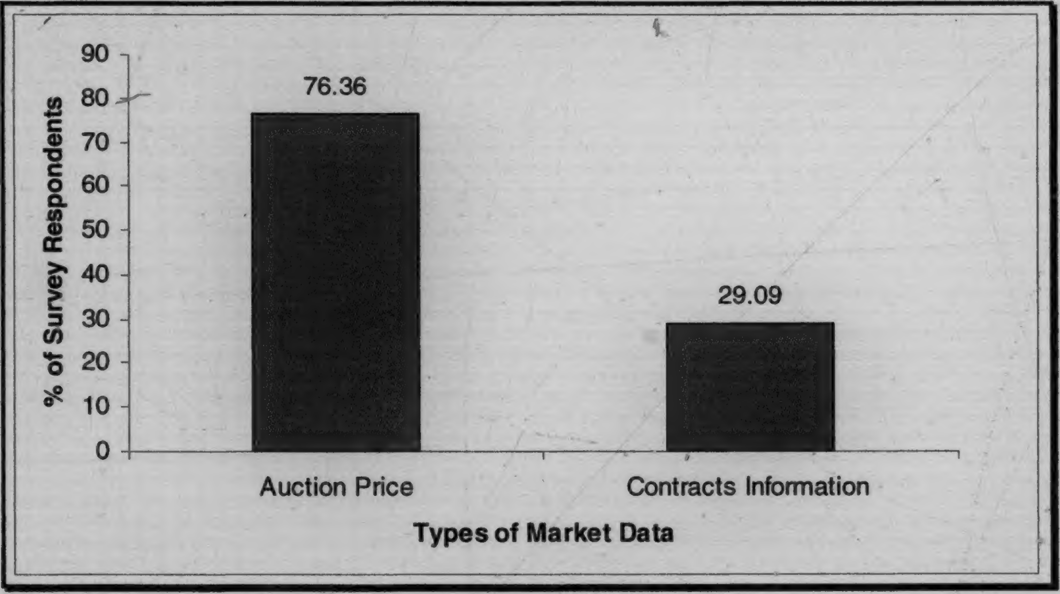


Figure 4.23 Production Information Needed in Cattle Production and Marketing (No. =110)

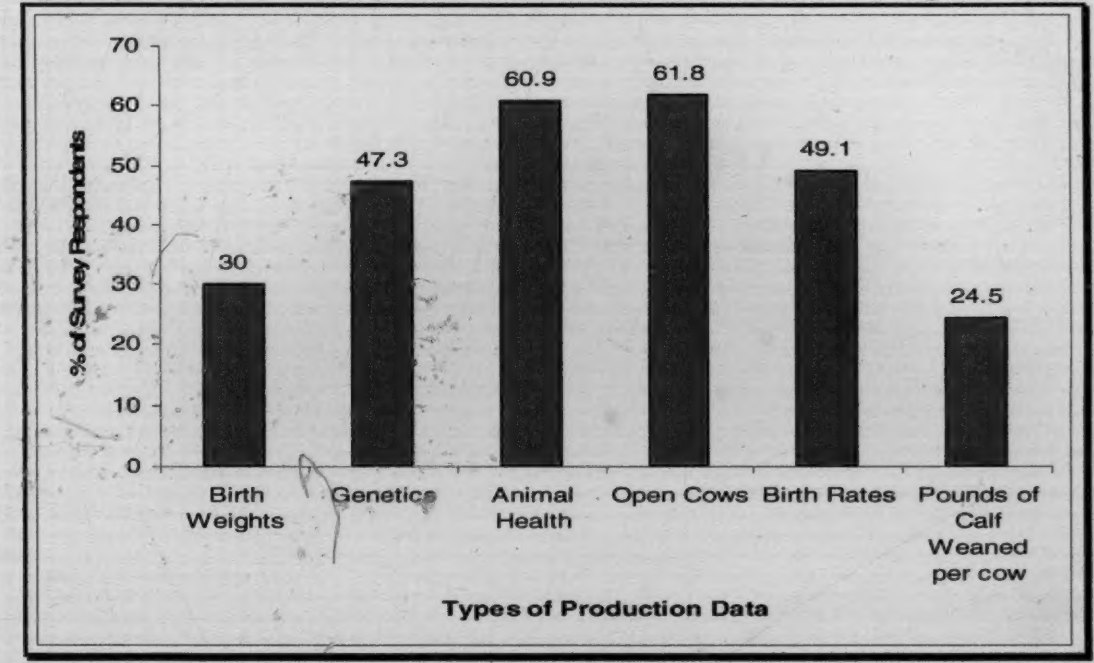


Figure 4.24 Cost of Production Information Needed in Cattle Production and Marketing (No. =110)

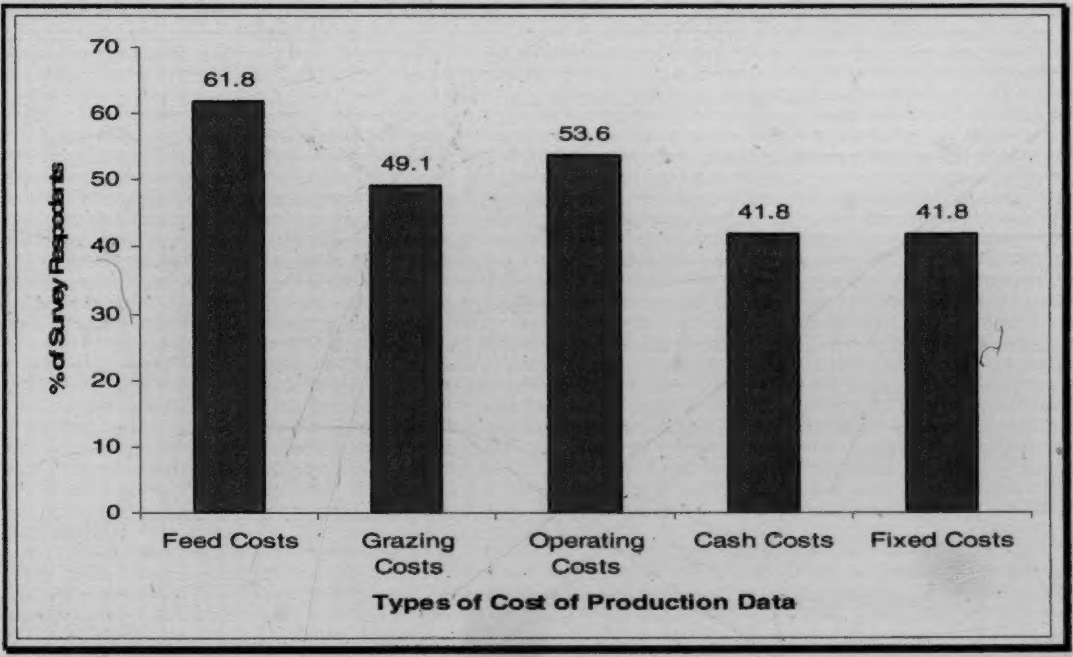


Figure 4.25 Using Information in Cattle Production and Marketing (No. =110)

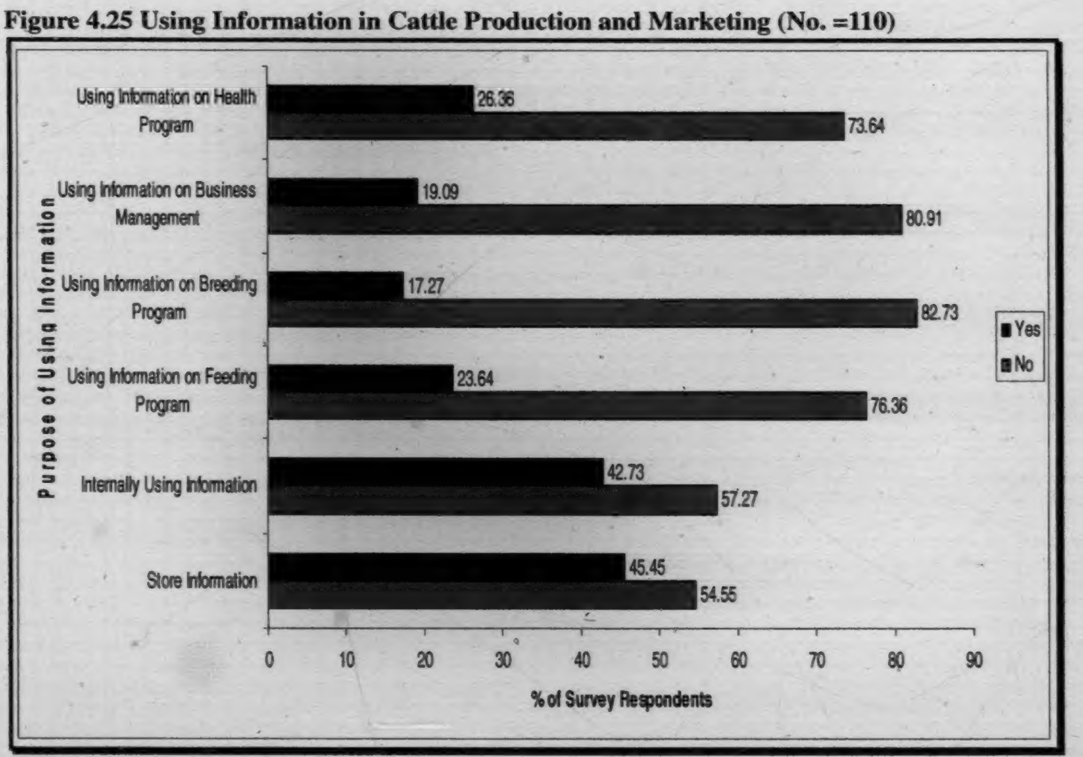


Figure 4.26 Information Sources in Cattle Production and Marketing (No. =110)

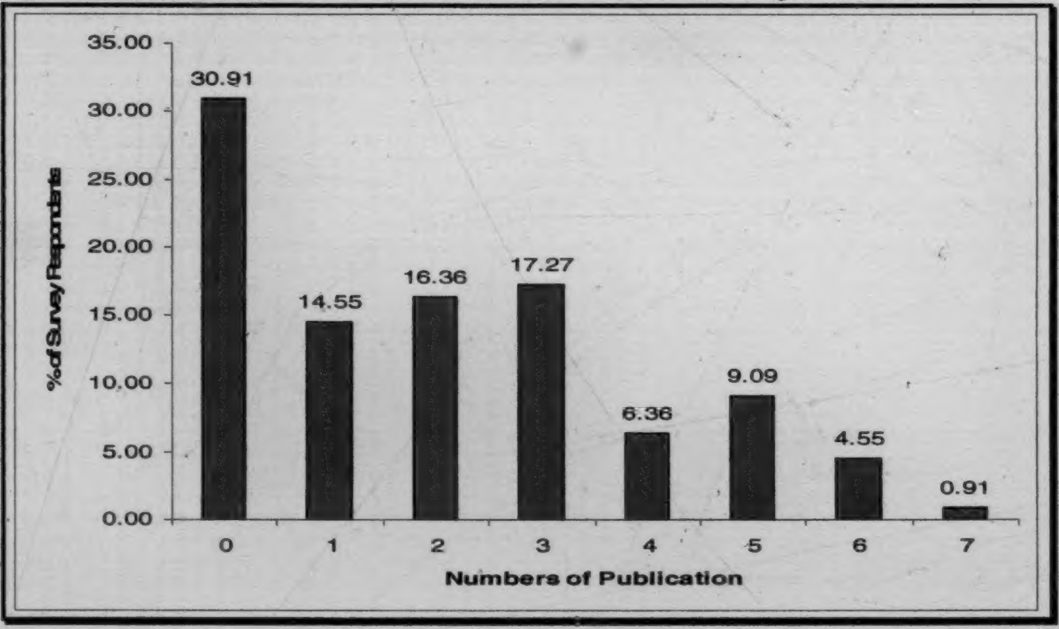


Figure 4.27 Beef Alliance Participation (No. = 110)

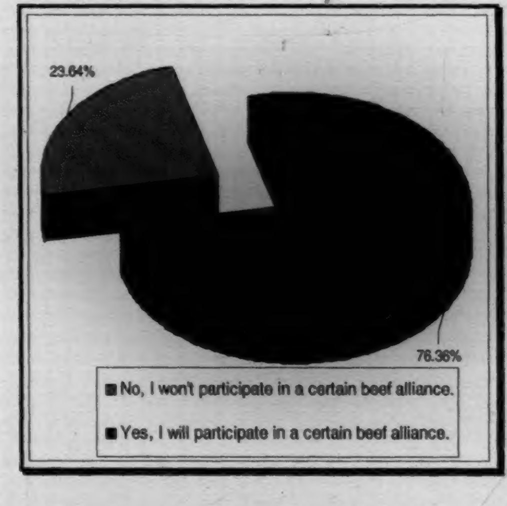


Figure 4.28 Beef Specialization in Particular Breed (No. = 110)

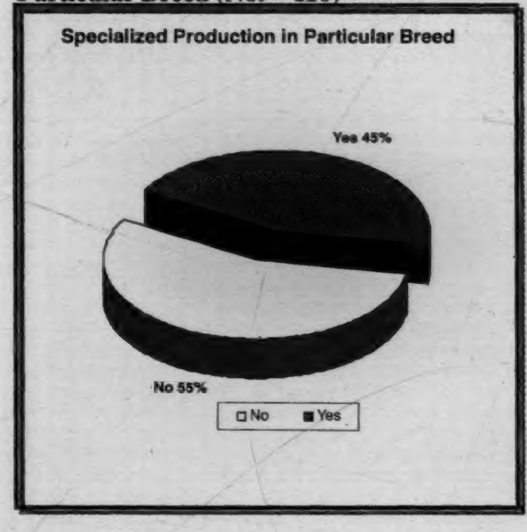
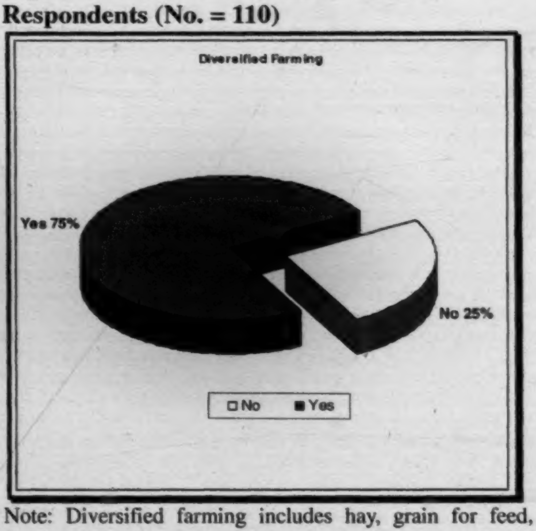


Figure 4.29 Diversified Productions by Respondents (No. = 110)



Note: Diversified farming includes hay, grain for feed, horse, pork, and so on.

Figure 4.30 Expectations for Production Protocols in The Future (No. = 110)

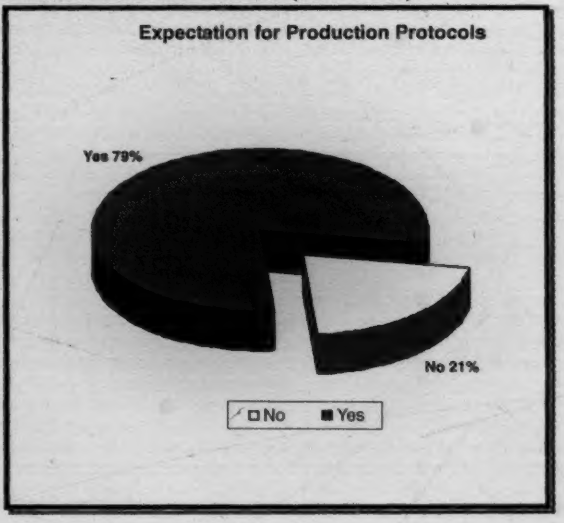
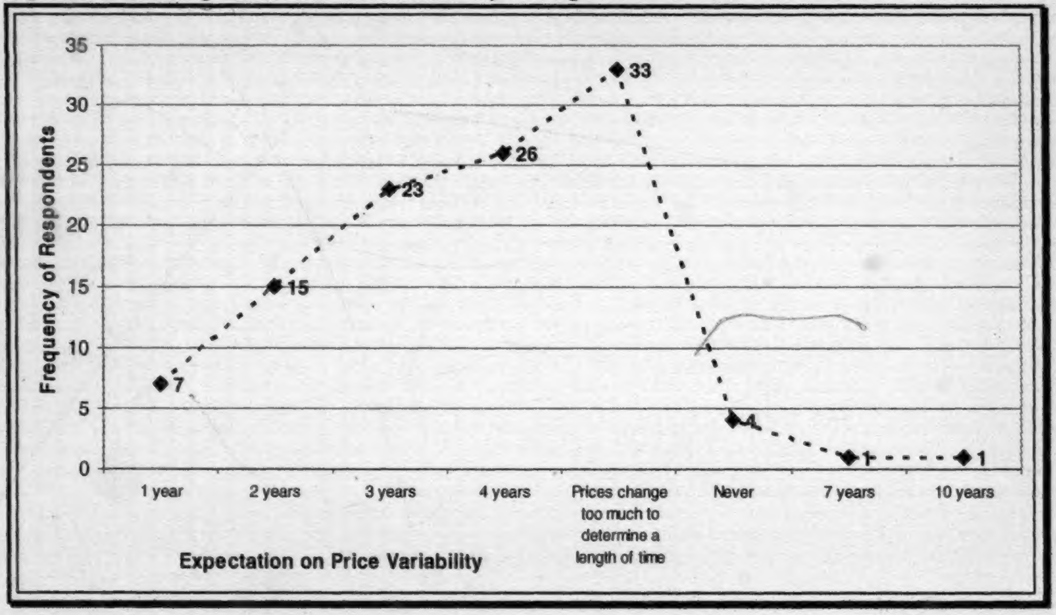


Figure 4.31 Perceptions on Price Variability of Replacement Cow



Chapter 5 Model Development, Empirical Results and Policy Implication

5.1 Introduction

The chapter discusses the model development and estimation. Based on the survey design introduced in Chapter 4, a hierarchical model structure is discussed in section 5.2. In section 5.3, the results of the empirical model are discussed. The influence of respondents' demographic and socio-economic characteristics on their choice behavior of beef alliances is investigated here. In section 5.4, the estimation results are used to provide a discussion on beef alliances.

5.2 Model Development

5.2.1 Hierarchical Model Structure

As shown in **Figure 5.01**, respondents who answered "yes" in the first part of the survey will automatically be exposed to the choice experiment, in which four versions of binary choice questions need to be answered. With regard to respondents who answered "no" in the first part of the survey, they are directly channeled to the third part of the questionnaire. Although the hierarchical model structure is constructed as a nested decision tree, it cannot be captured by a nested logit model because the respondents who answered "no" in the upper level were not confronted with the other beef alliance alternatives. However, from the theoretical framework developed in Chapter 4, the decision procedure can be modeled separately.

5.2.2 Variable Definitions: Choice-specific vs. Individual-specific Variables

The objective of the econometric analysis of this study is to estimate the relationship between the probability of binary choices and the explanatory factors that would have some impact on that probability. These explanatory factors include the choice-specific attributes (i.e., sales type, data sharing and production protocols) and individual-specific variables (e.g. demographic variables). In the model to explain the beef alliance participation (Model 1), no alternative of beef alliance was presented to the respondents. Therefore, the explanatory variables only consist of a variety of individual-specific variables. In contrast to Model 1, the model to explain the choice experiment (Model 2) includes four categories of choice-specific attributes as presented in Chapter 4. In addition, individual-specific variables are also incorporated into the Model 1, to test whether they affects the choice behavior of respondents.

5.2.2.1 Model 1

Selected individual-specific variables that could affect the producer's decision in the beef alliance participation may be categorized under the following headings: farmer's individual characteristics and farmers' alternative marketing and production practices. Following the basic binary logit model structure presented in Chapter 4, the full version of selected variable incorporated into Model 1 is presented in **Equation (9)**.

$$\textbf{(9)}\quad \Pr ob(y = participate) = \frac{e^{\sum_{k=1}^{k}\beta_k x_k}}{1 + e^{\sum_{k=1}^{k}\beta_k x_k}}$$

$$\sum_{k=1}^{k}\beta_k x_k = \beta_1 + \beta_2 x_2 + \beta_3 x_3 + \beta_4 x_4 + \beta_5 x_5 + \beta_6 x_6 + \beta_7 x_7 + \beta_8 x_8 + \beta_9 x_9 + \beta_{10} x_{10}$$

Where

X_2 =survey method (on-line or on-site); X_3 =operation type; X_4 =age; X_5 =education level;

X_6 =income from beef; X_7 =beef cowherd size; X_8 =needs for information;

X_9 =experience of using retained ownership; X_{10} =experience of using contracts

Variables that represent farmer's individual characteristics include a dummy of farmer's operation type, age, education level, percentage of net income from beef, and beef cowherd size in terms of number of cows. Variables categorized as farmer's alternative marketing and production practice include a dummy of farm enterprises other than beef production, a dummy that indicates whether the individual farmer used specific breed in beef production, a dummy that indicates whether the individual farmer used retaining ownership strategy before, and a dummy that indicates whether the individual farmer used contractual agreements before. Due to the small sample size (No. =110) of this study, it is necessary to reduce the number of variables included in final model specifications. Based on the descriptive statistics of data sample discussed in Chapter 4, the variables of age, education level and farm income from beef production were pooled as dummies. The variable of beef cowherd size was pooled as a two level dummy coded variable. In addition to these individual characteristics variables, a dummy variable was included for the survey method that identifies on-line and on-site interviews. A summary of descriptive statistics of the variables selected is presented in **Table 5.01**.

5.2.2.2 Model 2

By presenting an individual with two alternative beef alliances, a binary logit model can be used to analyze how choice-specific attributes that differ between alternatives affect a respondent's choice. The basic model for choice experiment is defined as follows,

$$\textbf{(10)}\quad \Pr ob(y = allianceA/B) = \frac{e^{\sum_{k=1}^{k} \beta_k x_k}}{1 + e^{\sum_{k=1}^{k} \beta_k x_k}}$$

$$\sum_{k=1}^{k} \beta_k x_k = \sum_{t=1}^{4} \beta_{1t} x_{1t} + \sum_{t=1}^{4} \beta_{2t} x_{2t} + \sum_{t=1}^{4} \beta_{3t} x_{3t} + \beta_4 x_4$$

Where

X_{1t} = sales type level t;

X_{2t} = data sharing level t;

X_{3t} = production protocols level t;

X_4 = continuous membership fee level.

Data collected through the survey were formatted before the analysis could be preceded. The estimation does not use an alternative specific constant (ASC) because individuals are choosing between two generic alternatives (unlabelled binary choice experiment), such that an ASC has no meaning (Hensher et al. 2005). To map the non-linear effect that can result when using qualitative data, effects coding was used (Louviere et al. 2000).

Similar with dummy coding, effects coding eliminates one attribute level and creates a separate variable for each of the remaining levels. For the 4-level attributes in this study, a base level is omitted and the three remaining attribute levels are coded separately. For example, a 1 is coded if that attribute level is present in the profile, a 0 if it is not present, or a -1 if the base attribute is present. Coefficient estimates for this base attribute level equal the negative sum of the estimates for the other three attribute levels. To avoid the problem of singularity, one level of attribute for each choice-specific attribute must be omitted in the estimation procedure. The omitted levels formulate a "status quo" for estimation. In this study, an attributes combination including sales type of "retain ownership, No profit sharing", information sharing scheme of "live performance, per pen", and production protocols of "No restrictions on vaccination and use of antibiotics & No minimum number of animals required" makes up a "status quo" of current beef industry. Therefore, the representing variables were dropped automatically when estimating the model.

Decision makers' demographic and socioeconomic characteristics are expected to influence their choice behavior. The inclusion of demographic and socio-economic characteristics in the utility function may introduce respondents' heterogeneity into the model estimation process (Train 2003). Due to the relatively small sample size, the selected demographic variables only include age, education level, farm income from beef and beef cowherd size. One may be interested in the effects of survey methods (on-line vs. on-site) that may affect the individual choice behavior. A dummy of representing survey method is incorporated into the estimation procedure. Because these variables reflect the differences in preferences for alliance A and alliance B as functions of age, education, income and beef cowherd size. It is essentially in the same way as the alternative-specific constant. Following Ben-Akiva and Lerman (1985), these individual-specific variables must be normalized or interacted with other attributes. **Table 5.02** lists the definitions and codes for the postulated independent variables, including both choice-specific attributes and individual-specific attributes in the model estimation.

5.3 Estimation and Empirical Results

The separate binary logit models presented in preceding section were estimated with maximum likelihood procedure using statistical software ***LIMDEP*** version ***8.0*** and ***NLOGIT*** version ***3.0.*** respectively (Greene 2002, 2002).

5.3.1 Model 1: Beef Alliance Participation

5.3.1.1 Homogeneity Test & Further Model Specification

Since the respondents could complete the survey either on-line survey or on-site, a homogeneity test is conducted to test if the two groups of respondents can estimated jointly. The test statistic for homogeneity is: $\chi 2 = [(\sum_{groups}$ log likelihood for the group) - log likelihood for the pooled sample] (Greene 2002). The degrees of freedom is G-1 (G represents the number of groups) times the number of coefficients in the model. Based on **Table 5.03**[11], $\chi 2$ in the model that includes full version of selected variables is less then the critical value 18.307, given a significance level of 5%. Therefore, the two sub samples are homogeneous and it is valid to pool them together. After pooling two sub samples, four versions of models were estimated. A dummy variable that represents the method of conducting survey instrument (on-line vs. on-site) was incorporated into the final model. The results are presented in **Table 5.04.** As shown in **Table 5.05,** likelihood ratio tests suggest that the null hypothesis that the estimated coefficient for a particular breed production and for diversified production equal zero cannot be rejected at the 5% level. The null hypothesis that estimates of either of them equals zero was not rejected at the 5% level as well. The log likelihood ratio test indicates that **model 4** as presented in **Table 5.04** provides the best fit.

5.3.1.2 Empirical Results

The final logit model to analyze beef alliance participation is presented in **Table 5.06**. The overall model (joint $\chi 2$) is highly significant at the 1% significance level. The model has an McFadden-R^2 statistic of 0.26, indicating a reasonably well-fitted model for this type of cross-sectional data (Louviere et al. 2000). Another way to measure goodness-of-fit is to use a 2 x 2 predictive table to measure the model's predictive ability. As shown in **Table 5.07,** the model predicts 90 of 110, or 82.7%, of the observations correctly. These results also suggested a good fit of the model.

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[11] The log likelihood estimates in the on-line sample is low because about 88% of respondents in the on-line sample had positive answer in the question of "beef alliance participation" (45 out of 51 respondents).

In a logit model, the interpretation of coefficient estimates is different from that in linear probability models. The direction of the effect is determined by the sign of the explanatory variable, but the magnitude of the effect of the explanatory variable on the dependent variable changes (i.e., each variable's marginal contribution to choice probabilities) can be obtained by a derivative approach (Greene 2002). In a binomial logit model, the marginal effect depends on the sign of β_k, which is the coefficient of the explanatory variables, denoted by x_k. For a continuous or a scale discrete explanatory variable, the marginal effect on the choice probability can be expressed as the derivative,

(11) $$\frac{\partial F(x_i\beta)}{\partial x_{ik}} = F'(x_i\beta)\frac{\partial x_i\beta}{\partial x_{ik}} = f(x_i\beta)\beta_k\,,$$

where $f(x_i\beta)$ is the density function, and β_k denotes the coefficient of x_{ik}. When one of the variables in x is a dummy variable, the derivative approach to estimating the marginal effect is not appropriate. Following Greene (2003), an alternative is

(12) $$\Delta Fx_k = \Pr ob[y=1 \mid x_k = 1] - \Pr ob[y=1 \mid x_k = 0]\,.$$

In this model, all the variables are dummy-coded.

The results of the coefficient estimates and marginal effects are as following:

1. Survey Type

Although the homogeneity test of sub samples for the on-line survey and on-site survey suggested that both subsamples can be pooled together, it is desirable to examine the effect of using different survey methodologies. The coefficient of survey type is statistically significant at 95% confidence interval. The negative sign indicates that the samples from on-site interview are unlikely to participate in a beef alliance.

2. Producer Type

The coefficient of producer type (only cow-calf operation vs. mixed characteristics) is significant at the 10% significance level. The negative sign indicates that if the beef enterprise is only limited to a cow-calf operation, the producer is unlikely to participate in a beef alliance. On the contrary, producers who have mixed production characteristics are more likely to participate in a beef alliance.

3. Age

The effect of age on beef alliance participation choice is indeterminate. On the one hand, older and more experienced cattle producers might recognize the advantages of alternative marketing arrangements such as beef alliances and, thus are willing to adopt them. On the other hand, older producers may be slower to adopt newer marketing procedures; an analog is the reluctance of older producers to adopt new technology (Feder et al. 1985). The coefficient of variable representing age is significant at the 10% significance level and the negative sign indicates that the younger producers are more likely to participate in a beef alliance.

4. Education

It is expected that educated producers are more likely to adopt alternative marketing practices, as they are more informed from school and may recognize the advantages of alternative marketing arrangements. Thus, college/university educated producers are expected to be the potential users of alternative marketing arrangements such as beef alliances. The coefficient of education is significant at the 10% significance level, which suggests that producers with an educational level of high school and lower levels of education are unlikely to participate in a beef alliance.

5. Income

The results presented in **Table 5.06** show an insignificant estimate of farm income from beef. Confounding influences in the variable representing income variable may underlie this lack of significance. For example, off-farm income and off-farm employment opportunity may be a factor that would justify the sign on the income variable (Dorfman 1996). Unfortunately, the response rate in off-farm income/employment opportunity is poor as shown in Chapter 4, so that the adjusted model that incorporated these variables cannot offer more insights into this issue.

6. Beef Cowherd Size

Previous studies have shown that farm size is usually positively related to technology adoption (Feder and Slade 1984; Dorfman 1996). Larger producers are more likely to adopt a new technology (Dinar and Yaron 1990). The coefficient representing beef cowherd size is significant at 5% significance level. And the negative sign on the variable implies that the smaller cow-calf producers are less likely to participate in a beef alliance.

7. Use of Information

The variable representing producers' attitudes toward information is not significant in the model. However, the positive sign is as expected, since it implies that producers who indicated that they use information (e.g., marketing data, contract data, data on cost of production, production and processing data) are more willing to participate in a beef alliance.

8. Experience of Using Retained Ownership and Contracts

The coefficients of the variables that indicate the producers' experience of using retained ownership and contracts are conflicting in some way. It was expected that producers who have experienced retaining ownership and contracts would be more likely to participate in a beef alliance (because either of these two strategies implies a closer vertically coordinated marketing relationship throughout the value chain). The estimate of the experience of using retained ownership is significant at the 10% significance level, but the sign of the coefficient is negative, indicating a negative attitude toward participating in a beef alliance. In contrast, the sign on the estimates of the experience of using contracts is positive as expected, indicating that it has significant impact on their choice behavior in beef alliance participation.

5.3.2 Model 2: Choice Experiment

5.3.2.1 Model Identification

The stated preference results of the two models are shown in **Table 5.08**. Model 1 includes only ten choice-specific variables for the choice experiment that are presented in **Equation (10)**. A dummy (on-line vs. on-site) was incorporated for the survey method into Model 2 (on the basis of Model 1) to examine the effects of different survey methods on the estimation. Model 1 and Model 2 displayed a McFadden R^2 of 0.07 and 0.10 respectively, which suggests a relatively low fit of this type of model (Louviere et al. 2000). However, it should be recalled that a small sample size can lead to large variances in the models and thus insignificant coefficient estimates and low model fit (Lee et al. 2000). In addition, the log-likelihood ratio statistic of 32.64 (model 1) and 46.58 (model 2) (**Table 5.08**), are statistically significant at the 5% level, and suggest hat the attributes/factors examined in the model are jointly important. By conducting a log-likelihood ratio test, Model 2 is accepted at the 5% level. As discussed previously, most producers (88%) participating in the on-line version of survey chose to participate in a beef alliance. The relatively low McFadden R^2 might result from this uneven structure of the sample.

Following equation (11) and (12), the marginal effects of each attribute level are also presented in Table **5.09**. The final model (Model 2 in **Table 5.08**) suggests that none of the attributes that represent "production protocols" are significant at the 10% level. The dummy for the survey method is significant at the 1% level. The remaining coefficient estimates are as following:

1. Sales Type (marketing methods)

The first category of variables from **Table 5.08** to be discussed concerns the marketing strategies adopted by a beef alliance (S1-S4). The base level that was dropped for estimation was the sales type of "retain ownership, No profit sharing" (S3). The coefficient of S4 (retain ownership, profit sharing) is not significant at the 10% level. The negative sign on the estimate of S1 indicates most producers rejected this marketing strategy, and the positive sign on the estimate of S4 indicates a positive attitude toward this marketing strategy. Taking the base level (S3) into consideration, the following order of producers' preferences for the attribute of sales type (from high to low) can be derived: "sell to the alliance, bonuses based on animal performance", "retain ownership, profit sharing", " retain ownership, No profits sharing" and "sell to alliance, No profit sharing", respectively. The difference between "sell to alliance" and "retain ownership" suggests that cow-calf producers choose away from scenarios with potential profits resulting from retaining ownership, toward scenarios where profits can be realized in a fast way. Considering the negative sign on the coefficient of "experience of retaining ownership", it not hard to rationalize why producers prefer this marketing strategy to selling to an alliance directly. Although retained ownership of cattle can generate potential profits, the risk-averse cow-calf producers still seek for a way to realize the profits in a short run, because relative longer cattle production period cannot keep a stable and continuous cash flow for those cow-calf producers that have a smaller size relative to feedlots operators and packers. In this situation, a marketing strategy similar to auction markets (i.e., sell to alliance directly) is perceived to be superior to a closer vertically coordinated relationship (i.e., retain ownership).

2. Information Sharing Scheme (data sharing)

Results from the basic model (**Table 5.08**) show that this category of attributes strongly influences individual choice behavior. The base level dropped in estimation procedure was the data sharing scheme of "live performance, pen" (D1). All coefficients have a positive sign except for D3 (carcass, group data), indicating a positive attitude away from the base toward these data sharing schemes. The coefficients of both D2 (live performance, individual data) and D3 (carcass, group data) are significant at the 5% level. The only insignificant attribute in this category is D4 (carcass, individual yield & grade data). Together with the base level (D1), the preference order appears to be that producers choose from D2 (live performance, individual data), D4 (carcass, individual yield & grade data), D1 (live performance, per pen), and then D3 (carcass, group data). Similarly to the attributes of sales type, cow-calf producers' preference for the information sharing schemes is limited to a low intensity level of coordination scheme. Respondents appear to opt away from the spot cash market (live performance, per pen), towards a closer level of coordination (live performance, individual data). The respondents' higher preference for higher levels of coordination, such as "carcass, individual yield and grade data", could be explained by higher transaction costs and asset specificity investment. The results also suggest that producers' prefer using individual data rather group data (D1: pen, D2: group). This result is in line with Schroeder et al. (1998). Their study suggests that live performance data based on group (pen) animals inhibits information flow from beef consumers to cattle producer[illegible] As indicated in Chapter 2, this result also suggests that although cattle feeders and packers can be better off by applying a value-based or grid pricing system, if cow-calf producers are not effectively involved in a grid pricing system due to the separation of production stage, the grid pricing scheme will have little impact on their choice behavior.

3. Production Protocols

All coefficients that represent the attributes of "production protocols" are insignificant at the 10% level. The base level dropped in estimation procedure was the production protocols of "No restrictions on vaccination and use of antibiotics & No minimum number of animals required" (P1). Producers' preferences are in the following order: P2 (NO restrictions on vaccination and use of antibiotics & minimum number of animals required), P3 (restrictions on vaccination and use of antibiotics & No minimum number of animals required), P4 (restrictions on vaccination and use of antibiotics & minimum number of animals required), and P1 (No restrictions on vaccination and use of antibiotics & No minimum number of animals required). The insignificant coefficient estimates show the production protocols have no significant impact on the producers' choice behavior. Production protocols imply an increase in assets specificity investment. The transaction cost economics literature discussed in Chapter 3 suggests that the producers' utility will decrease with an increasing investment in assets specificity. Trimming transaction costs to maximize profits results in producers' opting away from the high level of coordination mechanism (P2, P3 and P4) towards the status quo (P1). In the experiment design, the attribute level of P2 and P3 can be treated as equivalent. However, the controversial sign on these coefficient estimates from **Table 5.08** show that the producers' attitude toward "restrictions on vaccination and use of antibiotics" and "minimum number of animals required" is different. The producers' positive attitude toward accepting "restrictions on vaccination and use of antibiotics" suggests that producers expect more quality control and restrictions in the future.

4. Membership Fee

The fourth characteristic through which a beef alliance represented is a membership fee. The coefficient for the FEE attribute is negative, as expected. This indicates that the presence of a higher membership fee decreases utility. The FEE coefficient is significant at the 5% level, but small in magnitude (-0.01). Also, the marginal analysis on membership fee can be interpreted as follows. An increase in the membership fee attribute for the alliance A of 1 unit will decrease the choice probability for participating this type of alliance by 0.004, *ceteris paribus*. These results suggest that membership fees play a significant role in a producer's choice behavior in participating in alternative beef alliance, but its effect is very small .

5. Survey Methods

To examine the effects of survey methods, the dummy was normalized following the methods introduced by Ben-Akiva and Lerman (1985) and Hensher, et al. (2005).

$$\text{(13)} \quad \begin{Bmatrix} U_{allianceA} = \beta_0 * X_{methods} + \beta_A^{'} X_{choice-specific} + \varepsilon_A \\ U_{allianceB} = \beta_B^{'} X_{choice-specific} + \varepsilon_B \end{Bmatrix}$$

Where $X_{methods}$ = a dummy of survey methods;

$X_{choice-specific}$ = choice-specific variable in the basic model.

The coefficient of survey methods shown in **Table 5.08** is positive and significant at the 1% level. Based on the specification of **Equation (13)**, this result indicates that producers who answered questionnaire through the on-site interview are more likely to choose alliance A than alliance B. Although this result has no economic meaning in the basic model, it can help to explain the relatively low McFadden R^2. More importantly, the interaction effect between survey method and demographic variables can provide useful insights into the preference for survey methods of different groups of respondents.

5.3.2.2 Demographics

To examine the effect that demographic characteristics may have on an individual's choice of a beef alliance, interaction terms are used. By interacting demographic variables with attribute levels that do vary across alternatives, it may be possible to establish a relationship between individual characteristics and alternative preference. To explore this relationship, a series of four trials were run. In each trial, a single demographic variable was interacted with all attribute levels variables and a dummy of survey method from the basic model (Model 2 in **Table 5.08**). Across these total four trials, all four demographic variables produced at least one interaction coefficient that was significant at the 10% level (**Table 5.10**). However, to test whether a demographic variable significantly affected choice behavior, a joint test of each trial's interaction terms was performed. **Table 5.10** summarize the results of the interaction trials. Of the four trials, only HERD and INCOME passed the joint test with a **Wald** statistic significant at the 10% level.

Examining the significant interaction terms in the two trials that passed the joint Wald test offers some information on the relationship between demographic characteristics and choice behavior. In the first trial, the estimate for D2 (live performance, individual data) was 0.154 and the coefficient estimate for the interaction term HERD* D2 was estimated at 1.628. Together, these terms have a cumulative effect on an individual's utility. The HERD term describes the level of beef cowherd size, with categories ranging from 1 (small beef cowherd size) to 0 (large beef cowherd size). As the HERD variable moves from 0 to 1, the interaction term will become larger. This suggests that smaller beef producers prefer an information sharing scheme using individual live performance data. In the case of D4 (carcass, individual yield & grade data), explaining the choice behavior is more difficult. The estimate for D4 was estimated at 0.42 and the coefficient estimate for the interaction term HERD* D4 was estimated at -0.93. A positive sign on the coefficient of D4 indicates a positive attitude toward information sharing scheme that uses carcass, individual yield and grade data. However, the cumulative effects suggest that the smaller beef producers do not prefer a beef alliance with an information sharing scheme of D4. This result does agree with the previous analysis in the basic model of choice experiment.

In the second trial, the INCOME variable was used in interaction with HERD. The results are similar to that of the information sharing scheme as producer's income move from high to low (0 to 1). Another notable significant interaction term is S4 (retain ownership, profits sharing). The estimate for S4 was 0.32 and the coefficient estimate for the interaction term INCOME* S4 was estimated at -0.84. The cumulative effects suggest that the low income beef producers are not willing to choose a beef alliance with a sales type of S4 (retain ownership, profit sharing). The INCOME variable was expected to have an impact on the attributes of membership fee. Although the negative sign on the coefficient estimate of INCOME*FEE suggests a negative attitudes of low income beef producers as membership fees increase, the interaction term is not significant at the 10% level.

5.3.2.3 Willingness to Pay

Using the results from model 1 and 2, the marginal willingness to pay (MWTP) can be estimated. This is obtained by taking the ratio of the coefficient of interest using the coefficient for cost as the numeraire (Hanemann 1984). As shown in function (10), the utility function is assumed to be a linear function of the attributes of the choice experiment in this study. According to Hanemann (1984), this implies that the marginal WTP can be obtained from the estimated parameters by scaling the attribute coefficient estimates with the cost coefficient. Hence, the marginal WTP is simply the marginal rate of substitution between one of the attributes in the choice experiment and the cost attribute, which is the membership fee in this study. However, this is the conditional marginal WTP since it is the WTP given that the respondent is willing to participate in a beef alliance. In order to obtain the sample marginal WTP, the non-participants which by definition have a zero WTP must be taken account. The sample WTP can be defined as (Carlsson and Kataria 2006):

$$\textbf{(14)}\; E[WTP] = P[Participant] * E[WTP|Participant] + P[Non-participant] * E[WTP|Non-participant]$$

Where $E[WTP \mid Non\text{-}participant] = 0$.

Following Carlsson and Kataria (2006), the zero MWTP for non-participants, given that the cost is zero, implies that the non-participants experience neither utility, nor disutility from the beef alliance. Hence, the non-participants get disutility by paying for a beef alliance alternative regardless of what attribute levels the alternative has to offer. Furthermore, the sample WTP of the attributes is restricted to be non-negative as long as the participants on average have a positive WTP for the attribute in question. Using the results presented in **Table 5.08** (the basic model 2), both the conditional MWTP and unconditional MWTP are estimated as shown in **Table 5.11**.

The estimates in **Table 5.11** are instructive for comparing the ranking of attributes and levels. For both sample respondents (unconditional) and respondents in choice experiment (conditional), the most important attributes for a beef alliance in this sample is the information sharing scheme, in which producers associated higher MWTP with the attribute level of "live performance, individual data" rather than the level of "carcass, individual yield & grade data". In this attribute category, the level of "Carcass, group data" was not preferred by the producers in this sample. The second most important attributes is sales type. Producers are willing to pay between $15.26/ head and $6.43/head for the attribute of "sale to alliance, bonus on the animal performance" and "retain ownership, profit sharing". However, producers are not willing to pay for the attribute of "sale to alliance, No profit sharing". The least important attribute is related to the production protocols; producers are willing to pay only $5.06/head for the attribute of "No restrictions on vaccination and use of antibiotics & minimum number of animals required" while they are not willing to pay for the attributes "restrictions on vaccination and use of antibiotics & No minimum number of animals required" and "restrictions on vaccination and use of antibiotics & minimum number of animals required".

5.4 Alternative Beef Alliance Scenarios and Policy Implications

The insights from those scenarios can be used to explore producers' motivations for choosing new and different types of beef alliances in the future.

1. Alternative Beef Alliance Scenario (S2 vs. S4)

The first scenario assumes that there are two alternatives, Alliance A and B. Both of these alternatives have the same attributes except that the sales type in alternative A is "sell to alliance, bonuses based on animal performance" while the one in alternative B is "retain ownership, profit sharing". Given the estimated results reported in **Table 5.08,** the probability of choosing alternative A is 54.08% and the probability of choosing the "retain ownership, profit sharing" (alternative B) is 47.83%. It requires a cost reduction of 58% of the membership fee to equalize the probability of choosing between these two sales types (**Table 5.12**).

2. Alternative Beef Alliance Scenario (D2 vs.D4)

The second scenario assumes that there are two alternatives, Alliance A and B. Both of these alternatives have the same attributes except that the information sharing scheme in alternative A, which is "live performance, individual data" while the one in alternative B is "carcass, individual yield & grade data". In this case, the probability of choosing alternative A is 59.22% and the probability of choosing the "retain ownership, profit sharing" (alternative B) is 47.06%. It requires a cost reduction of 66% of the membership fee to equalize the probability of choosing between these two alternatives (**Table 5.13**).

3. Alternative Beef Alliance Scenario 3 (P2 vs. P4)
When alternative A has the same attributes as B except that the production protocols in alternative A is "No restriction and min. number of animals required" and the one in alternative B is "Restriction and minimum number of animals required", the probability of choosing alternative A is 75.42% and the probability of choosing the alternative B is 68.06 %. In this case, it requires a cost reduction of 55% of the membership fee to equalize the probability of choosing between these two productions protocols (**Table 5.14**).

The scenarios reported above were designed by shifting from the most preferred attributes (based on the ordinal ranking of coefficient estimates and MWTP), toward the attribute level with the highest degree of vertical coordination in the choice experiment. These results suggest a significant cost reduction associated with the shifts in a single category of attributes. Considering the small magnitude of the price factor (i.e., membership fee) estimated coefficient obtained from this sample, the incentive problem toward the higher degree of vertical coordination cannot be solved only by reducing the financial commitment on the beef alliance. As expected, the trade-off between the significant cost reduction and an improvement of vertical coordination implies that a different type of compensation scheme is desirable.

5.5 Summary and Conclusions

This chapter provided a description of the model that was used to analyze respondents' choices of beef alliances. After presenting the variable definitions, econometric identification issues were discussed, and the selection of demographic and socio-economic attributes was explained. The second section of the chapter presented two binary logit models. In the beef alliance participation model, producer's age, education level, beef cowherd size, and experience of using retained ownership have a significant impact on the producers' decision making. The choice experiment provides further insights into the producers' preferences for different types of beef alliances. In general, the marketing and compensation methods (sales type), information sharing scheme (data sharing) and membership fee affect the choice behavior of the respondents significantly. However, the production protocols have no significant impact on the individual choice behavior. The two binary logit models that were used in the analysis also suggest that survey methods (on-line vs. onsite) have a significant impact on the producers' choice behavior. Based on the unconditional and conditional MWTP estimated in this sample, the respondents appear to have conservatively positive attitudes toward alternative beef alliance. The last section of the chapter provides simulation results based on three hypothetical scenarios, and discusses some policy implications. The next chapter provides an overview of this study, discusses its limitations, and gives suggestions for further study.

5.6 Appendix: Tables and Figures

Table 5.01 Descriptive Statistics and Descriptions of Variables in Beef Alliance Participation Model

Variable	Descriptions	All Respondents		On-line Respondents		On-site Respondents	
		Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation
Dependent Variable							
Alliance	Beef Alliance Participation(1=yes; otherwise 0)	0.76	0.43	0.88	0.33	0.66	0.48
Independent Variable							
OPT	Operation Type (1=Cow-calf Operations; otherwise 0)	0.56	0.50	0.57	0.50	0.56	0.50
BREED	Specified in Particular Breed Production(1=yes; otherwise 0)	0.44	0.50	0.47	0.50	0.44	0.50
DIVER	Farm Enterprises other than Beef Production(1= yes; otherwise 0)	0.75	0.40	0.67	0.48	0.75	0.44
AGE	Producer Age(1= less than 50;otherwise 0)	0.55	0.50	0.59	0.50	0.55	0.50
HERD	Beef Cowherd Size (1=Less than 150 heads; otherwise 0)	0.38	0.49	0.27	0.45	0.38	0.49
EDU	Producer's Education (1=less than high school(included);otherwise 0)	0.54	0.50	0.39	0.49	0.54	0.50
INCOME	Farm Income from Beef (1 =less than 50%; otherwise 0)	0.47	0.50	0.47	0.50	0.47	0.50
INFORMATION	Needs for Information (1=yes; otherwise 0)	0.57	0.50	0.47	0.50	0.57	0.50
RETAIN	Experiences of using retained ownership (1=yes; otherwise 0)	0.55	0.50	0.63	0.49	0.55	0.50
AGREE	Experiences of using Contracts(1=yes; otherwise 0)	0.51	0.50	0.47	0.50	0.51	0.50
	No. of Observations	110		51		59	

Table 5.02 Descriptive Statistics and Descriptions of Variables in Choice Experiment Model

Variable		Descriptions	Mean	Standard Deviation
Sales Type(Base=Retain Ownership, No profits Sharing)	**S1**	Sell to alliance, NO profit sharing	-0.01	0.74
	S2	Sell to alliance, bonuses based on animal performance	-0.11	0.66
	S3	Retain ownership, NO profit sharing	0.28	0.45
	S4	Retain ownership, profit sharing	0.01	0.75
Information Sharing Scheme (Base=live performance, pen)	**D1**	live performance, pen	0.32	0.47
	D2	live performance, individual data	-0.11	0.72
	D3	Carcass, group data	-0.07	0.75
	D4	carcass, individual yield & grade data	-0.09	0.73
Production Protocols(Base=No restrictions on vaccination and use of antibiotics & No number of animals required	**P1**	NO restrictions on vaccination and use of antibiotics & NO min. number of animals required	0.22	0.41
	P2	NO restrictions on vaccination and use of antibiotics & min. number of animals required	-0.04	0.63
	P3	Restrictions on vaccination and use of antibiotics & NO min. number of animals required	0.12	0.74
	P4	Restrictions on vaccination and use of antibiotics & min. number of animals required	0.04	0.69
Membership Fee	**FEE**	$0,$5,$10,$20	8.53	7.71
Individual-specific Variables	**SRT**	Survey Method(1=on-site interview; otherwise 0)	0.23	0.42
	AGE	Producer Age(1= less than 50;otherwise 0)	0.60	0.49
	EDU	Producer's Education (1=less than high school(included);otherwise 0)	0.48	0.50
	INCOME	Farm Income from Beef (1 =less than 50%; otherwise 0)	0.45	0.50
	HERD	Beef Cowherd Size (1=Less than 150 heads; otherwise 0)	0.29	0.45
		No. of Observations	672	

Note: The variables of S3, D1 and P1 make up a “status quo” (base level) of current beef industry, which are dropped from the model in estimation procedure

Table 5.03 Homogeneity Test of On-line and On-site Sample

Variable	All (N0.=110)		On-line (No.=51)		On-site (No.=59)	
	Coefficients	Standard Error	Coefficients	Standard Error	Coefficients	Standard Error
CONSTANT	3.82**	1.19	35.25	1.05E+06	1.73	1.65
OPT	-1.32*	0.69	-0.54	1.91	-1.39	0.93
BREED	0.01	0.03	-1.24	2.82	0.01	0.03
AGE	1.14**	0.58	-30.63	1.05E+06	0.64	0.93
DIVER	-0.65	0.72	2.26	2.18	1.22*	0.73
HERD	-2.31**	0.74	-4.67*	2.86	-2.15**	1.04
EDU	-1.28**	0.61	-1.52	2.11	-0.41	0.75
INCOME	0.13	0.66	-1.36	1.92	0.15	0.87
INFOR	0.66	0.65	2.42	2.11	0.54	0.89
RETAIN	-0.91	0.76	-0.73	2.59	-1.90*	1.16
AGREE	0.40	0.55	-0.43	1.72	1.18	0.71
Log Likelihood	**-44.35**		**-8.28**		**-28.82**	

*Significant at the 10% significance level. ** Significant at the 5% significance level.

Table 5.04 Summary of Statistical Results of the Model Specification: Beef Alliance Participation

Variable	Model 1		Model 2		Model 3		Model 4	
	Coefficient	Standard Error	Coefficient	Standard Error	Coefficient	Standard Error	Coefficient	Standard Error
Constant	4.66***	1.35	4.15**	1.24	4.27***	1.20	4.08**	1.17
Survey Type	-1.36**	0.69	-1.37**	0.67	-1.39**	0.68	-1.38**	0.67
OPT	-1.43**	0.71	-1.27*	0.68	-1.43**	0.70	-1.28*	0.68
BREED	0.01	0.03			0.01	0.03		
DIVER	-0.57	0.76	-0.11	0.70				
AGE	1.08*	0.60	1.12*	0.58	1.02*	0.59	1.11*	0.58
HERD	-2.45***	0.81	-2.30**	0.77	-2.44***	0.79	-2.30**	0.77
EDU	-1.01	0.64	-1.03*	0.63	-0.97	0.64	-1.02*	0.63
INCOME	-0.02	0.70	0.14	0.68	0.05	0.69	0.15	0.67
INFOR	1.00	0.71	0.71	0.66	0.89	0.69	0.69	0.65
RETAIN	-1.44*	0.84	-1.38*	0.81	-1.46*	0.83	-1.39*	0.81
AGREE	0.68	0.59	0.54	0.57	0.63	0.58	0.54	0.57
Log Likelihood	-42.19		-44.35		-42.47		-44.36	
Restricted Log Likelihood	-60.15		-60.15		-60.15		-60.15	
McFadden's R^2	0.30		0.26		0.29		0.26	
No. of Observations	110		110		110		110	

*Significant at the 10% significance level. ** Significant at the 5% significance level. ***Significant at the 1% significance level.

Table 5.05 Log Likelihood Ratio Test Results of Beef Alliance Participation Model

Hypothesis	Unrestricted Model(L0)	Restricted Model(L1)	Degree. Freedom	-2*(L1-L0)	χ^2	Results
$H_0: Breed = 0 \,\&\, Diver = 0$ $H_1: Breed \neq 0 \,\&\, Diver \neq 0$	-44.36	-42.19	2	4.34	5.99	Not Reject
$H_0: Breed = 0 \,\&\, Diver \neq 0$ $H_1: Breed \neq 0 \,\&\, Diver \neq 0$	-44.36	-44.35	1	0.02	3.84	Not Reject
$H_0: Diver = 0 \,\&\, Breed \neq 0$ $H_1: Breed \neq 0 \,\&\, Diver \neq 0$	-44.36	-42.47	1	3.78	3.84	Not Reject

Table 5.06 Summary of Statistical Results of the Logit Model: Beef Alliance Participation

	Coefficient	Standard Error	Marginal Effects	Expected Sign
Constant	4.08**	1.17	0.51***	N/A
Survey Type	-1.38**	0.67	-0.17**	N/A
Producer Type	-1.28*	0.68	-0.15***	-
Age	1.11*	0.58	0.14*	+
Beef Cowherd Size	-2.30**	0.77	-0.35***	-
Education	-1.02*	0.63	-0.13*	-
Income	0.15	0.67	0.02	N/A
Information Activity	0.69	0.65	-0.17	+
Retained Ownership	-1.39*	0.81	0.09*	+
Contracting Farming	0.54	0.57	0.07	+
Log Likelihood		-44.36		
Restricted Log Likelihood		-60.15		
x^2		31.58		
P-Value		0.00		
McFadden's R^2		0.26		
No. of Observations		110		

** Significant at the 5% significance level. ***Significant at the 1% significance level. Marginal effects are calculated by taking the probability differences. Otherwise, marginal effects are evaluated at the median.

Table 5.07 Predicted Table of Beef Alliance Participation Model

		Predicted		
		D=0	*D=1*	Total
Actual	D=0	10	16	26
	D=1	4	80	84
	Total	14	96	110

Table 5.08 Summary of Statistical Results of Basic Models: Choice Experiment

Variables	Descriptions	Model 1		Model 2	
		Coefficient	Standard Error	Coefficient	Standard Error
S1	Sell to alliance, NO profit sharing	-0.34**	0.15	-0.42***	0.16
S2	Sell to alliance, bonuses based on animal performance	0.37	0.24	0.43*	0.25
S3	Retain Ownership, No profit sharing	-0.18	0.20	-0.19	0.21
S4	Retain ownership, profit sharing	0.15	0.17	0.18	0.17
D1	Live performance, per pen	-0.21	0.14	-0.23	0.14
D2	live performance, individual data	0.70***	0.21	0.43**	0.22
D3	Carcass, group data	-0.53***	0.18	-0.41**	0.18
D4	carcass, individual yield & grade data	0.04	0.16	0.20	0.17
P1	No restrictions on vaccination and use of antibiotics & No min. number of animals required	-0.12	0.16	-0.10	0.17
P2	No restrictions on vaccination and use of antibiotics & min. number of animals required	0.08	0.16	0.14	0.16
P3	Restrictions on vaccination and use of antibiotics & No min. number of animals required	0.05	0.17	-0.01	0.17
P4	Restrictions on vaccination and use of antibiotics & min. number of animals required	0.00	0.18	-0.04	0.18
FEE	$0,$5,$10,$20	-0.02**	0.01	-0.02**	0.01
SRT	Survey Method:1=on-site;otherwise,0			0.75***	0.20
	Log-likelihood	-215.05		-208.08	
Restricted Log-likelihood		-231.37		-231.37	
The log-likelihood ratio test		32.64		46.58	
McFadden R^2		0.07		0.10	

*Significant at the 10% significance level. ** Significant at the 5% significance level. ***Significant at the 1% significance level.

Table 5.09 Marginal effects on the Attributes of Beef Alliances

Variables	Descriptions	Coefficient	Marginal Effect
S1	Sell to alliance, NO profit sharing	-0.42***	-0.09
S2	Sell to alliance, bonuses based on animal performance	0.43*	0.09
S3	Retain Ownership, No profit sharing	-0.19	-0.04
S4	Retain ownership, profit sharing	0.18	0.04
D1	Live performance, per pen	-0.23	-0.05
D2	live performance, individual data	0.43**	0.09
D3	Carcass, group data	-0.41**	-0.09
D4	carcass, individual yield & grade data	0.20	0.04
P1	NO restrictions on vaccination and use of antibiotics & No min. number of animals required	-0.10	-0.02
P2	NO restrictions on vaccination and use of antibiotics & min. number of animals required	0.14	0.03
P3	Restrictions on vaccination and use of antibiotics & NO min. number of animals required	-0.01	0.00
P4	Restrictions on vaccination and use of antibiotics & min. number of animals required	-0.04	-0.01
FEE	$0,$5,$10,$20	-0.02**	0.00
SRT	Survey Method:1=on-site;otherwise,0	0.75***	0.16

*Significant at the 10% significance level. ** Significant at the 5% significance level. ***Significant at the 1% significance level.

Table 5.10 Summary of Statistical Results of Demographic Trials: Choice Experiment

Variable	Descriptions	Age Trials		Education Trials		Herd Trials		Income Trials	
		Coefficient	Standard Error	Coefficient	Standard Error	Coefficient	Standard Error	Coefficient	Standard Error
S1	Sell to alliance, No profit sharing	-0.59	0.27	-0.29	0.23	-0.58***	0.19	-0.55**	0.22
S2	Sell to alliance, bonuses based on animal performance	1.03**	0.46	0.97**	0.39	0.72**	0.30	0.38	0.35
S4	Retain ownership, profit sharing	0.01	0.31	-0.19	0.27	0.20	0.22	0.32	0.25
D2	live performance, individual data	0.41	0.37	0.25	0.31	0.15	0.25	0.05	0.29
D3	Carcass, group data	-0.12	0.29	-0.45*	0.26	-0.45**	0.22	-0.53*	0.29
D4	carcass, individual yield & grade data	0.06	0.26	0.46*	0.25	0.42**	0.21	0.92***	0.27
P2	No restrictions on vaccination and use of antibiotics & min. number of animals required	-0.03	0.27	0.38	0.24	0.15	0.20	0.19	0.27
P3	Restrictions on vaccination and use of antibiotics & No min. number of animals required	-0.09	0.28	-0.08	0.27	0.00	0.21	0.04	0.26
P4	Restrictions on vaccination and use of antibiotics & min. number of animals required	0.17	0.33	-0.24	0.26	-0.15	0.22	-0.12	0.23
FEE	$0,$5,$10,$20	0.00	0.02	-0.04*	0.02	-0.02	0.01	-0.03	0.02
SRT	Survey Method:1=on-site;otherwise,0	0.68**	0.30	0.00	0.28	0.18	0.33	0.41	0.27
AS1	AGE*S1	0.21	0.34						
AS2	AGE*S2	-1.06*	0.57						
AS4	AGE*S4	0.27	0.38						
AD2	AGE*D2	0.09	0.47						
AD3	AGE*D3	-0.55	0.39						
AD4	AGE*D4	0.28	0.36						
AP2	AGE*P2	0.08	0.36						
AP3	AGE*P3	0.19	0.36						
AP4	AGE*P4	-0.23	0.40						
FAGE	AGE*FEE	-0.05*	0.02						
S11	AGE*SRT	-0.01	0.42						
ES1	EDU*S1			-0.32	0.34				
ES2	EDU*S2			-0.84	0.56				
ES4	EDU*S4			0.65*	0.38				
ED2	EDU*D2			0.84*	0.48				
ED3	EDU*D3			0.02	0.41				
ED4	EDU*D4			-0.76**	0.37				
EP2	EDU*P2			-0.42	0.36				
EP3	EDU*P3			0.17	0.36				
EP4	EDU*P4			0.38	0.39				
FEDU	EDU*FEE			0.01	0.02				
S22	EDU*SRT			1.35***					
HS1	HERD*S1					0.64	0.46		
HS2	HERD*S2					-0.78	0.72		
HS4	HERD*S4					-0.29	0.50		
HD2	HERD*D2					1.63**	0.67		
HD3	HERD*D3					-0.52	0.49		

Continued Table 5.10 Summary of Statistical Results of Demographic Trials: Choice Experiment

HD4	HERD*D4					-0.93**	0.46		
HP2	HERD*P2					0.08	0.48		
HP3	HERD*P3					0.18	0.44		
HP4	HERD*P4					0.38	0.53		
FHERD	HERD*FEE					-0.02	0.03		
S33	HERD*SRT					3.00	0.41		
IS1	INCOME*S1							0.39	0.35
IS2	INCOME*S2							0.86	0.61
IS4	INCOME*S4							-0.84*	0.43
ID2	INCOME*D2							1.12**	0.52
ID3	INCOME*D3							0.11	0.39
ID4	INCOME*D4							-1.36***	0.38
IP2	INCOME*P2							-0.34	0.36
IP3	INCOME*P3							-0.33	0.38
IP4	INCOME*P4							0.64	0.43
FINC	INCOME*FEE							-0.01	0.02
S44	INCOME*SRT							1.29***	0.44

Statistic	**Age Trials**	**Education Trials**	**Herd Trials**	**Income Trials**
McFadden's R^2	0.13	0.18	0.19	0.17
Wald Statistic	1.00	1.90	3.98	3.27
Sig. Level	0.32	0.17	0.05	0.07
Log-likelihood	-200.70	-190.78	-188.18	-190.98

*Significant at the 10% significance level. ** Significant at the 5% significance level. ***Significant at the 1% significance level.

Table 5.11 Marginal Willingness to Pay for Attributes

Attributes			Conditional WTP($/head)	Unconditional WTP($/head)
Category	Code	Descriptions		
Sales Type(Base=Retain Ownership, No profits Sharing)	S1	Sell to alliance, NO profit sharing	-19.47*	-14.87*
	S2	Sell to alliance, bonuses based on animal performance	19.99*	15.26*
	S3	Retain Ownership, No profit sharing	-9.50	-7.25
	S4	Retain ownership, profit sharing	8.42	6.43
Information Sharing Scheme (Base=live performance, pen)	D1	Live performance, per pen	-11.50	-8.78
	D2	live performance, individual data	19.92*	15.21*
	D3	Carcass, group data	-18.73*	-14.30*
	D4	carcass, individual yield & grade data	9.31	7.11
Production Protocols(Base=NO restrictions on vaccination and use of antibiotics & No number of animals required	P1	No restrictions on vaccination and use of antibiotics & No min. number of animals required	-5.00	-3.82
	P2	No restrictions on vaccination and use of antibiotics & min. number of animals required	6.62	5.06
	P3	Restrictions on vaccination and use of antibiotics & No min. number of animals required	-0.40	-0.30
	P4	Restrictions on vaccination and use of antibiotics & min. number of animals required	-1.72	-1.31

*Significant coefficient estimates of attributes in **Table 5.08.**

Table 5.12 Alternative Beef Alliance Scenario 1

Attributes	Alliance A	Alliance B
Sales Type	Sell to alliance, bonuses based on animal performance	Retain ownership, profit sharing
Information Sharing Scheme	carcass, individual yield & grade data	carcass, individual yield & grade data
Production Protocol	Restrictions on vaccination and use of antibiotics & min. number of animals Required	Restrictions on vaccination and use of antibiotics & min. number of animals Required
Membership Fee	$20	$20
Probability of choice	54.08%	47.83%
Price change required for indifference	-	-58%

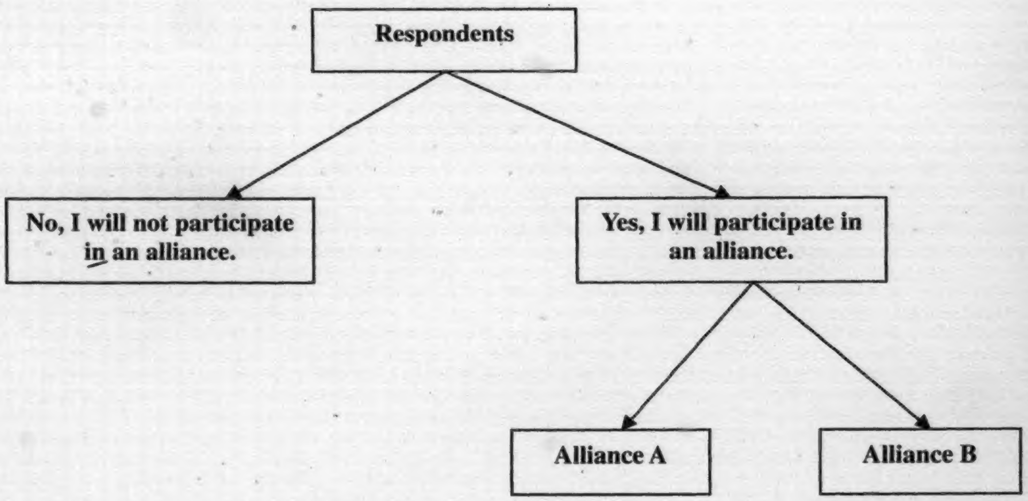
Table 5.13 Alternative Beef Alliance Scenario 2

Attributes	Alliance A	Alliance B
Sales Type	Sell to alliance, bonuses based on animal performance	Sell to alliance, bonuses based on animal performance
Information Sharing Scheme	live performance, individual data	carcass, individual yield & grade data
Production Protocol	Restrictions on vaccination and use of antibiotics & min. number of animals Required	Restrictions on vaccination and use of antibiotics & min. number of animals Required
Membership Fee	$20	$20
Probability of choice	59.22%	47.06%
Price change required for indifference	-	-66%

Table 5.14 Alternative Beef Alliance Scenario 3

Attributes	Alliance A	Alliance B
Sale Type	Sell to alliance, bonuses based on animal performance	Sell to alliance, bonuses based on animal performance
Information Sharing Scheme	live performance, individual data	live performance, individual data
Production Protocol	No restrictions on vaccination and use of antibiotics & min. number of animals Required	Restrictions on vaccination and use of antibiotics & min. number of animals Required
Membership Fee	$20	$20
Probability of choice	75.42%	68.06%
Price change required for indifference	-	-55%

Figure 5.01 Hierarchical model structures


Respondents
No, I will not participate in an alliance.
Yes, I will participate in an alliance.
Alliance A
Alliance B

Chapter 6 Summary and Conclusion

6.1 Introduction

This chapter gives a review and summary of the major findings of the study. Some limitations of the study are outlined and areas of further research are suggested. Some policy implications are provided based on the results of the study.

6.2 Overview of Findings

The main purpose of this study was to assess a variety of beef alliances from the perspective of cow-calf producers, such that incentive and organizational issues related to profit sharing, data exchange and risk management could be explored. Therefore, a survey was conducted among Western Canadian cow-calf producers in the spring of 2006. The survey questionnaire was designed to assess producers' preferences for a set of marketing contracts as part of participation in beef alliances. Two binary logit models were estimated, one as a standard binary logit model, and one as a conditional logit model. The influence of respondents' demographics and socio-economic characteristics on respondents' preferences for alternative beef alliance was analyzed.

Following Carlsson and Kataria (2006), a tree-structure of decision making procedure was mapped in the survey questionnaire design to distinguish between participants and non-participants. Through this approach, both unconditional marginal willingness to pay (MWTP) and conditional MWTP estimates were derived. These estimates can provide policy-makers with additional information about how important the strategic alliance program is to the welfare of the participants.

Our results suggest that cow-calf producers see benefits in participating in those beef alliances that were presented to them. They appear to see the underlying benefits from increasing formal contracting and the resulting improved coordination between actors in the beef supply chain.

The following variables significantly affected the beef alliance participation: survey method, producer type, age, education, beef cowherd size, and experience of using retained ownership. Somewhat unexpectedly, cow-calf producers that were interviewed through on-site surveys were found to be unlikely to participate in the beef alliances presented. Considering the entire sample (responses from both the on-line and on-site interviews), farms that were limited to cow-calf operations were found to be unlikely to participate in a beef alliance. On the contrary, producers who have mixed production characteristics are more likely to participate in a beef alliance. Further, younger producers are more likely to participate in a beef alliance than the older producers. Producers with relative lower educational level (i.e., high school and less) are less likely to participate in a beef alliance than those more educated producers. The smaller cow-calf producers are less likely to participate in a beef alliance than the large producers. Producers who have experience using retained ownership are less likely to participate in a beef alliance than those producers who did not retain ownership before. The demographic and socioeconomic characteristics that do not significantly influence or do not have a strong influence on respondents' choice behavior include respondent's income, attitude toward use of information and the experience of using marketing or production contracts. Most of these empirical results from the beef alliance participation model were consistent with prior hypotheses (i.e., expected sign) and the findings from other studies. Gillespie et al. (2004) concluded that younger, more educated and larger beef producers may be expected to more likely use of alternative marketing arrangements in cattle business such as strategic beef alliance. Brocklebank and Hobbs (2004) found that the beef cowherd size, age, education impact on the transaction characteristics of cow-calf producers, and influence their choice behavior in adopting alternative marketing and production practice. Kularatna (2000) also found that cow-calf producers who have mixed production operations are more likely adopt alternative marketing and production practices.

It is worth emphasizing that producers' use of production and management-related information does not have a significant impact on alliance participation, although a positive relationship between them was as expected. It was expected that the need for information sharing is one of the major incentives for beef producers to closer vertically integrate. Because the participants and non-participants were distinguished through the hieratical structure of survey questionnaire (**Figure 5.01**), a further exploration of the attitude toward information sharing was examined through the conditional logit model.

The results from the conditional logit model suggest that the attributes of "sales type", "information sharing scheme" and "membership fee" significantly affect the respondent's choice behavior. Producers appear to opt away from the status quo of non-integration, toward a closer coordinated beef marketing and production system. Production protocols did not have a significant impact on the respondent's choice behavior.

The results obtained from the conditional logit model further suggest that the following order of producers' preferences for the attribute of sales type (from high to low) can be derived: "sell to the alliance, bonuses based on animal performance", "retain ownership, profit sharing", "retain ownership, No profit sharing" and "sell to alliance, No profit sharing", respectively.

Considering respondents' attitudes towards information sharing schemes, there appears to be a clear preference to opt away from spot cash markets (live performance, per pen), towards a closer level of coordination (live performance, individual data). Following "live performance, per pen", the respondents' next preferred choice is to use information sharing scheme of "carcass, individual yield & grade data", followed by "carcass, group data". The results also suggest that producers prefer using individual data rather group data (D1: pen, D2: group). Similar findings have been reported for the US by Schroeder et al. (1998), as their results suggest that live performance data based on group (pen) animals inhibits information flow from beef consumers to cattle producers.

With regard to the attribute of "production protocols", each level of this attribute insignificantly affects the respondent's choice behavior. But the magnitude and sign of coefficient estimates suggest that producers' preferences for production protocols are in the following order: "No restrictions on vaccination and use of antibiotics & minimum number of animals required", "restrictions on vaccination and use of antibiotics & No minimum number of animals required", "No restrictions on vaccination and use of antibiotics & No minimum number of animals required" and "restrictions on vaccination and use of antibiotics & minimum number of animals required".

The attribute of 'membership fee' examined the respondent's preference for different level of financial commitments to beef alliances. As expected, an increasing participation fee lowers the respondents' utility and willingness to participate in an alliance. However, the small magnitude of the estimated coefficient also suggests that this effect is slight.

The interactions terms with demographic variables indicate that only income and beef cowherd size have a significant impact on the respondent's choice behavior. The interaction terms also suggest that compared to larger beef producers, smaller ones prefer an information sharing scheme that relies on individual live performance data. The cumulative effects also suggest that the smaller beef producers do not prefer a beef alliance with an information sharing scheme of "carcass, individual yield & grade data". This result is in accordance with the previous analysis of the basic conditional logit model.

With regards to different farm income levels, the cumulative income effects suggest that lower income beef producers are less likely to choose a beef alliance with a sales type of 'retain ownership, profit sharing' compared to high income beef producers. However, the farm income level does not have significant impact on the preference for different levels of membership fees.

Based on the results from conditional logit model, the marginal willingness to participate in a beef alliance (MWTP) was estimated. For both sample respondents (unconditional) and respondents in choice experiment (conditional), the most important attributes for a beef alliance is the information sharing scheme. Producers associate higher MWTP with "live performance, individual data" rather than "carcass, individual yield & grade data". The results further suggest that the second most important attribute is sales type. Producers are willing to pay between $15.26/ head and $6.43/head for the sales type options that were available ("sell to alliance, bonus on the animal performance" and "retain ownership, profit sharing", respectively). However, and as expected, producers are not willing to pay for the attribute of "sell to alliance, No profit sharing". The least important attribute is related to the production protocols; producers are willing to pay only $5.06/head for the attribute of "No restrictions on vaccination and use of antibiotics & minimum number of animals required" while they are not willing to pay for the attributes "restrictions on vaccination and use of antibiotics & No minimum number of animals required" and "restrictions on vaccination and use of antibiotics & minimum number of animals required".

6.3 Policy Implications

The results of this analysis enable us to highlight some issues regarding formal contractual arrangements and the design of strategic alliances in the Canadian beef industry. Given the assumptions and the limited sample size of this study, the following implications can be derived:

(1) Although the use of conventional auction market is still a dominant marketing strategy in the current beef supply chain, cow-calf producers recognize the limitation of spot cash transaction where consumer's needs for specific qualities can only be matched imperfectly. This is reflected in the fact that cow-calf producers show a positive attitude toward alternative marketing arrangements such as strategic alliances.

(2) Cow-calf producers are willing to move from the status quo of no coordination toward a higher level of vertically coordination. However, they are not willing to choose the highest level of vertically coordination. The highest levels of vertically coordinated mechanisms such as "carcass, individual yield and grade data", and "restrictions on vaccination and use of antibiotics & minimum number of animals required" imply a required increase in relation specific investment. The transaction cost literature suggests that the producers' utility will decrease with an increasing investment in asset specificity as the potential for hold-up increases (Williamson 1985). The results therefore suggest that cow-calf producers appear to recognize the increasing danger of being held-up. But they also suggest that producers consider the benefits from being able to access individual yield and grade data are not exceeding those costs associated with hold-up and relationship-building.

(3) Previous empirical research based on transaction cost perspectives in vertical coordination issues of beef industry suggested that the risk of opportunistic behavior as a result of investment in specific assets is minimal, and has not had a great impact on the degree of supply chain coordination (Brocklebank and Hobbs 2004). This study focuses on incentive problems within a broad theoretical framework (e.g., agency theory and property rights theory). Our results are broadly in line with previous studies. The insignificant coefficients of "production protocols" suggest that producers' specific investments in relationships with other members of the beef value chain have no impacts on their attitudes toward alternative vertical coordination scheme.

(4) To address the incentive problems that cow-calf producers face, a well-designed compensation scheme needs to be part of a beef alliance design. Our simulation and MWTP results suggest that cow-calf producers recognize the trade-off between significant cost reductions and an improvement of vertical coordination. However, an adjustment of financial commitments, such as reducing the level of alliance membership fees, is unlikely to be a sufficient way to solve the incentive problem that cow-calf producers face.

(4) Beef producer's individual specific characteristics (e.g., demographics) determine their decision-making on using alternative marketing arrangement (i.e., contractual arrangement and strategic beef alliance). In this study, beef cowherd size, education and age significantly influence producers' choice behavior. Further, the cumulative effects between these individual-specific characteristics and choice-specific factors (i.e., attribute) also play a significant role in their decision making. Thus, policy makers interested in supporting the emergence of beef alliances need to recognize the diversity, such that alternative marketing arrangements need to be targeted to different groups of producers, based on their specific needs.

(5) Based on our findings, cow-calf producers' preferences for attributes of alternative beef alliances (from high to low) are in the following order: information sharing scheme, sales type, production protocols, and membership fee. These results suggest that to design an effective information sharing scheme is both the key issue to overcoming cow-calf operations' incentive problems related to information asymmetries (i.e., moral hazard and adverse selection) and to designing more successful vertical coordination schemes. Further, the results also suggest that although cattle feeders and packers can be better off by applying a value-based or grid pricing system (i.e., carcass, individual yield & grade data), if cow-calf producers are not effectively involved in a grid pricing system, the grid pricing scheme is likely to fail in improving vertical coordination in Western Canadian beef supply chains.

6.4 Limitations and Further Research

One of the limitations of this study relates to the relatively small sample size. The final sample used in this study includes only 110 valid samples. Although data were collected on-line and on-site to increase the sample size, a low response rate (11.5%) was not overcome. As it is well-established in the discrete choice literature, small sample sizes can lead to large variances in choice models resulting in insignificant coefficient estimates and low model fit (Hensher et al. 2005; Lee et al. 2000). Further, given the small sample size, it is inevitable to reduce the number variables that can be incorporated into the model. In this study, we pooled all individual-specific variables as dummies in the beef alliance participation model, and only four major demographic trials were conducted to examine the interaction effects in the conditional logit model. All these efforts lead to a relatively good significance of the final model. However, the improved model fit comes at the cost of moving away from the data structure that was underlying the original survey questionnaire (e.g., the age categories were pooled). Further, since those respondents who indicated their unwillingness to participate in beef alliances were not participating in the choice experiment, the sample size that could be used for an analysis of beef alliance preferences was lower than it could have been otherwise. This strategy was pursued to focus on the analysis of alliance participants and non-participants as this provides insightful information.

The inability to effectively access cow-calf producer contacts outside of Alberta resulted in an over-sampling of Alberta producers. This was largely due to the fact that the regional beef associations were bound by their bylaws not to provide us access to their membership lists. Our 110 valid samples included 5 observations from British Columbia, 4 observations from Saskatchewan, and none from Manitoba. A regional diverse sample would have been highly desirable since we would expect that different transaction characteristics might result in different attitudes toward alternative marketing arrangements. For example, producers from Saskatchewan typically focus on cow-calf operations but sell their animals out of the province (Kularatna 2000).

A further limitation to this study, which is common to stated preference methods, includes the possible existence of hypothetical biases (Bishop and Heberlein 1979). Hypothetical biases arise when a situation lacks realism or when respondents find the survey instrument too complex or lengthy. In our study, we observed that survey method (on-line vs. on-site) had a significant impact on the estimates. Although the surveys were identical in design and presentation (laptop), the fact that trained students helped cow-calf producers to complete the surveys on-site could have led to a systematic bias. However, the systematic difference in responses between both producer groups is more likely to be a reflection of their openness for new technologies alternative risk-management strategies: as the descriptive statistics (Chapter 4) show, 88% respondents from on-line survey choose to participate in beef alliances.

To overcome some of the above limitations, it would have been desirable to combine revealed preference data with stated preference data, as revealed preference data provides actual information about respondents' choice behavior (Adamowicz et al. 1994; Louviere et al. 2000). However, in this study no revealed preference data is available because we cannot access the private information such as information on actual contract terms.

6.5 Conclusion

This thesis has provided an analysis of survey responses that were aimed at answering issues related to cow-calf producers' attitudes towards strategic alliances and a set of related marketing contracts. Various options regarding retained ownership status, data sharing, production protocols and other contract specifications were explored as possible drivers for alliance participation and supply chain coordination. The study has also evaluated the influence of demographic and socio-economic characteristics on individual producers' participation behavior in beef alliances. The data for this study were collected in 2006 from cow-calf producers in Western Canada, primarily Alberta. Two binary logit models were estimated. In the first model, the beef alliance participation model, producer's age, education level and beef cowherd size were found to have a significant impact on producers' decision making. The second model, the conditional logit model based on the choice experiment, provides further insights into producers' preferences for attributes of various beef alliances. The estimation results indicate that the marketing and compensation methods (sales type), the information sharing scheme (data sharing) and the size of the membership fees significantly affect the choice behavior of the respondents. However, the production protocols were found to have no significant impact on the individual choice behavior. The two binary logit models also suggest that survey methods (on-line vs. on-site) have a significant effect on the participation behavior in beef alliances. Not surprisingly, it appears that respondents' willingness to engage with technology is also reflected in their willingness to try new marketing options (beef alliances). Based on the unconditional and conditional MWTP estimated in this sample, the respondents appear to have conservatively positive attitudes in favor of alternative beef alliances. The MWTP results with regards to information sharing also suggest that it could be worthwhile for policy-makers to support the development of more effective information sharing systems, in an effort to spur industry investment that helps to overcome current alignment issues in the Canadian beef supply chain. It appears that information sharing is, not surprisingly, key to the design of successful compensation schemes between cow-calf producers and other key players in emerging beef value chains.

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Appendix A: The Survey Instrument

Dear Industry participant,

The National Beef Industry Development Fund (NBIDF) is supporting our research project "Formal beef alliances and alignment challenges: issues in contracting, pricing and quality". This interview is an important part of the project. Our research efforts have two main objectives. First, to design better contracts between the cow-calf sector and other sectors in the beef industry supply chain. Second, to evaluate the feasibility of using market based tools to manage price risk in the cattle industry.

You are part of a carefully selected sample that has been asked to assist with this interview, and we appreciate your assistance. As with all interviews we conduct your responses are confidential. Thank you for your participation and support!

PART I

1. Please indicate which of the following best describes your current operation (please choose one option only)?

    - cow-calf operation only
    - cow-calf + backgrounding
    - cow-calf + backgrounding + finishing
    - cow-calf + backgrounding + finishing + seedstock
    - seedstock producer
    - backgrounding only
    - finishing only
    - backgrounding + finishing

2. How many years has your business been producing beef cattle?

    ___ years

3. What did you do with your calf crop born in 2004? Please allocate percentages across the following options:

    - Sold as weaned calves .... ____ %
    - Sold as preconditioned calves .... ____ %
    - Retained ownership .... ____ %
    - Replacement heifers .... ____ %
    - Other: please describe; please use zero if not applicable. ____ %

    = **100** %

4. Do you specialize in a particular breed?
    A. Yes, ______________________

B. No

5. Please specify your December 2005 herd inventory in terms of the following size categories (please check the following boxes):

	Number of head:				
	None	Less than 50 head	51-150 head	151-300 head	300 and more
Cows					
Replacement heifers					
Stockers/ Yearlings					
Bulls					

6. How did you market your weaned calves in 2005? If multiple options apply, please rank the options in declining order (1 being the most frequently (or largest by head) used marketing option):
   - Sold through auctions .... ___
   - Retained ownership .... ___
   - Sold directly to backgrounder .... ___
   - Sold directly to feeder .... ___
   - Other:

7. If you used auction markets in 2005 **to sell your weaned calf crop**, what percentage of your calf crop was sold by the following public auctions:

   - Regional auction markets .... ___
   - Pre-sort auction .... ___

   = 100%

8. If you used auction markets in 2005 **to sell your feeders/backgrounders**, what percentage of your cattle was sold by the following public auctions:

   - Regional auction markets .... ___
   - Pre-sort auction .... ___

   = 100%

9. If you have used auction markets in the past, how would you judge the performance of those markets (in terms of competitive prices, rewarding qualities, handling), (a) for regular auctions and (b) for pre-sort auctions? Please place one mark in each column.

   (a) Performance of regular auction markets:

	… in terms of achieving a competitive price	… in terms of rewarding the qualities of my cattle	… in terms of professional livestock handling
They perform extremely well			
Very well			
Quite well			
Not very well			
Extremely poor			
Have not used regular auction			

(b) Performance of pre-sort auctions:

	… in terms of achieving a competitive price	… in terms of rewarding the qualities of my cattle	… in terms of professional livestock handling
They perform extremely well			
Very well			
Quite well			
Not very well			
Extremely poor			
Have not used a presort auction			

10. If you have retained ownership in the past, what type of financing of feeding and yardage was involved?
    - ➢ No financing of living expenses provided by backgrounder/feedlot __
    - ➢ I deposited __ % of the backgrounding costs with the backgrounder/feedlot upfront
    - ➢ Feed, yardage and other costs are settled at the end of the feeding period __
    - ➢ Feed, yardage and other costs are settled monthly __
    - ➢ Other (please specify):
11. In 2005, have you marketed cattle through an existing relationship agreement between producers and other members in a value chain (e.g. livestock cooperative/alliance)?
    - ▪ No __
    - ▪ Yes, __ less than 10%, ___ more than 25%, ___ more than 50% ___ 100%
12. Do you retain ownership of some of your calves **to background**?
    - • No: __ then please skip to question 13.

- Yes: __then please consider the following questions:

If you sold at the backgrounding stage, could you please indicate whether the following specifications hold in dealing with your buyer. If these specifications are not exactly matching those that apply to you, please choose what is closest to what you use in practice.

a) An average price based on regional auction markets is used in determining the final price

1. yes __
2. no __

b) Price premiums and discounts for not meeting specified characteristics are in place.

No __: please skip to question 13

Yes __

These premiums/discounts are associated with:

1. your breed __ yes
   __ no
2. a regional average price that is directly factored into your payment scheme
   __ yes
   __ no
3. other quality-related specifications (please specify):
   ____

13. Do you retain ownership of some of your cattle **until slaughter**?

- No: __ then please skip to question 14!
- Yes: __ then please consider the following questions:

In considering the payment method and the associated price level for your finished cattle sold in private sales, could you please indicate whether the following specifications hold in dealing with your buyer. If these specifications are not exactly matching those that apply to you, please choose what is closest to what you use in practice.

c) A regional average price is used in determining the final price

1. yes __
2. no __

d) Discount scales apply for carcasses over _______ lbs.

e) Price premiums and discounts for not meeting specified characteristics are in place.

No __, then please go to question 14.

Yes __

These premiums/discounts are associated with

1. quality grade __ yes__ no

2. yield grade __ yes__ no
3. regional average price__ yes__ no
4. other specifications related to carcass weight: ______________

f) The premiums and discounts associated with your above choices are as following:

__ -20% __ -15% __ -10% __ -5% __ +5% __ +10% __ +20%

PART II

Please let us know whether, in principle, you would consider future participation in a formal agreement between cow-calf producers and other members in a value chain. You have the opportunity to be part of a beef alliance that is developing niche markets. There is the potential for generating extra margins for your business if the alliance is able to produce animals of suitable qualities based on genetics and specific production protocols. Your animals are close to or ready to qualify for participating in this alliance.

() Yes, I am willing to participate in an alliance under certain circumstances
() No, I am not willing to participate in an alliance under any circumstances

Next you will be asked to choose between different types of alliances (with different specifications). You will vote four times between two alternative options. Please choose only one option on each screen. Assume that the options on each page are the only ones available. Each time, please vote independently from the other votes - please do not compare options on different screens.

1. Sale type refers to the ways in which you are willing to market your animals with the alliance (e.g. sell animals to alliance, retain ownership)
2. Type of data sharing refers to the different levels at which you would want to share data with the alliance.
3. Production protocols refers to the type of production protocols you would agree to related to vaccines, weaning and other production practices.

Example of Choice Experiment

Attributes	Alliance A	Alliance B
Sale Type	Sell to alliance, bonuses based on animal performance	Sell to alliance, No profit sharing
Information Sharing Scheme	live performance, individual data	live performance, individual data
Production Protocol	Restrictions on vaccination and use of antibiotics & No min. number of animals Required	Restrictions on vaccination and use of antibiotics & min. number of animals Required
Membership Fee	$0	$5
I would choose	☐	☐

PART III

1. In the future, feedlots (backgrounders) may opt to require specific production protocols from cow-calf producers. Therefore, written contracts may include more explicit cost sharing arrangements between feedlots and cow-calf producers/feedlots and backgrounders.

   Do you currently bear the costs for production protocols **fully** or **partially** in your operation? Please check all options that apply:
   - No, I don't bear any costs related to production protocols __ (then please proceed to question 2)

   Yes, I **fully** bear costs related to:
   - Herd health (vaccination/ vet visits) __
   - Genetics__
   - Unanticipated increases/decreases in feed costs __
   - Unanticipated death rates __

   Yes, I **partially** bear costs related to:
   - Herd health (vaccination/ vet visits)__
   - Genetics__
   - Unanticipated increases/decreases in feed costs __
   - Unanticipated death rates __

2. Please consider how market prices for cows have moved during the past few years. When replacement cow prices are very low, in your experience, how many years does it take for market prices for cows to return to the long run average price?
   - Never .... __
   - Prices change too much to determine a length of time __
   - 1 year __
   - 2 years __
   - 3 years __
   - 4 years __

- Other (number of years): __

3. What type of information do you collect for your beef enterprise? Please check all the categories that apply to your business.

Market data from the beef industry
  a. auction prices .... __
  b. information on contracts from other producers ...... __
  c. other: ____
Beef production data:
  d. birth weights ___
  e. genetics __
  f. animal health __
  g. open cows (dry cows) __
  h. birth rate __
  i. $ spent per wintered cow
  j. Pounds of calf weaned per cow wintered
  k. Other: ____
Beef processing data:
  l. carcass grading data on feeder cattle ___
  m. genetic tracking (parenting) __
  n. other: ____

4. How do you use the information that you collect for your enterprise? Please check all options that apply:

- I use it internally, without outside advice ___
- If you use outside (consulting/extension) advice, please rank the following options in the order of importance to your business (1 being most important, 4 least important):

	Rank
I use outside advice in my feeding program	
I use outside advice in my breeding program	
I use outside advice for my business management	
I use outside advice in my health management	

5. **How many**, and **which** cattle *and* business-related magazines/regular publications do you subscribe to (both related to your beef as well as your other businesses)?

I regularly subscribe to ___ publications.

Names of publications: ____

6. How do you manage risk outside of your beef business (crops, etc.)?

- ➢ I'm using forward cash contracts yes __ no __
- ➢ Yes, I'm hedging commodity futures yes __ no __
- ➢ I have insurance for: ______________________________
- ➢ Other: ....

7. If marketing your weaned calves with written contracts, do you
   - use forward cash contracts .... yes __ no __
   - use other pre-pricing contractual arrangements ...... yes __ no __
     - o if yes, please specify:

       ____

8. If you custom feed your calves (either from your own operation or purchased), do you have written or oral contracts in place for most of your business?
   - ➢ Oral contracts __ (then please proceed to question 9)
   - ➢ Written contracts __

   8. a. Consider your written contracts for custom feeding,
   - they apply to the calves placed with the custom feeder for a single production cycle: Yes __ no __
   - they carry over to following years,
     and the contract terms are re-negotiated annually __
     and the contract terms remain fixed for multiple production cycles __

   8.b. Have you had your own cattle custom fed in the past?

   NO __ please proceed to question 8.c.

If YES, please consider your written contracts for custom feeding. What features were (are) contained in those contracts? Please select all those options that apply:

1. Maximum cost of gain __
2. Safeguards against lower prices __
3. Known minimum price __
4. Safeguard against price variability __
5. Grid-based pricing __
6. Deferred compensation until after processing __
7. Electronic information exchange on animal performance __
8. Type of feed __
9. Markup for feed __
10. Yardage fee (overhead, maintenance) __
11. Death loss
12. Manual exchange of information on animal performance (printout) __
13. Financing as part of retained ownership through cattle feeder association __
14. Financing is arranged through the feedlot as part of retained ownership __
15. Margin sharing according to ownership proportion __

16. Margin sharing according to cost allocation __
17. Other (please specify):

Out of these 17 contract features, what are the **three most important ones** to you, and how would you rank these in terms of their ability to positively affect your business success (1 being most important, 5 least important)?:

- Rank 1: Number __
- Rank 2: Number __
- Rank 3: Number __

Consider those **three** contract features above (and the corresponding numbers), which ones are open for negotiation with your backgrounder/feedlot, **before** or **after** you signed the contract? Please check all options that apply:

	Contract terms that are open for negotiation **before** signing the contract	Contract terms that are open for negotiation **after** signing the contract
Number ___		
Number __		
Number __		

8.c. If in the future, you were to custom feed your calves, what would be important features that you would want to be included in those contracts?

Please select all those options that apply:

18. Maximum cost of gain __
19. Safeguards against lower prices __
20. Known minimum price __
21. Safeguard against price variability __
22. Grid-based pricing __
23. Deferred compensation until after processing __
24. Electronic information exchange on animal performance __
25. Type of feed __
26. Markup for feed __
27. Yardage fee (overhead, maintenance) __
28. Death loss
29. Manual exchange of information on animal performance (printout) __
30. Financing as part of retained ownership through cattle feeder association __
31. Financing is arranged through the feedlot as part of retained ownership __
32. Margin sharing according to ownership proportion __
33. Margin sharing according to cost allocation __
34. Other (please specify):

Out of these 17 contract features, what are the **three most important ones** to you, and how would you rank these in terms of their ability to positively affect your business success (1 being most important, 5 least important)?:

- Rank 1: Number __
- Rank 2: Number __
- Rank 3: Number __

Please indicate to what extent you agree that the reference price (base price?) should be tied to the following criteria:

	Strongly agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree
The reference price should be tied to boxed beef cutout value					
The reference price should be					

8.d. If in the future, you were to retain ownership of your calves and place them with a custom feeder, what would be important features that you would want to be included in those contracts?

Please select all those options that apply:

35. Maximum cost of gain __
36. Safeguards against lower prices __
37. Known minimum price __
38. Safeguard against price variability __
39. Grid-based pricing __
40. Deferred compensation until after processing __
41. Electronic information exchange on animal performance __
42. Type of feed __
43. Markup for feed __
44. Yardage fee (overhead, maintenance) __
45. Death loss
46. Manual exchange of information on animal performance (printout) __
47. Financing as part of retained ownership through cattle feeder association __
48. Financing is arranged through the feedlot as part of retained ownership __
49. Margin sharing according to ownership proportion __
50. Margin sharing according to cost allocation __
51. Other (please specify):

Out of these 17 contract features, what are the **three most important ones** to you, and how would you rank these in terms of their ability to positively affect your business success (1 being most important, 5 least important)?:

- Rank 1: Number __
- Rank 2: Number __
- Rank 3: Number __

9. If you retain ownership, what means of monitoring the performance of your animals at the feedlot/backgrounder level do you use? Please rank these monitoring schemes in order of significance to your business success (1 for most important, 3 for least important):
   - Rank __: I contact the feedlot (backgrounder) to view my animals (average frequency in weeks: ___)
   - Rank __: I ask for to see the printed records of my animals periodically
   - Rank __: I have 24hrs real-time access to electronic data of my cattle

10. How do the buyers of your cattle (backgrounders/feedlots) verify your own quality efforts as related to your cattle, before it leaves the farmgate?
    - There is no verification going on,
      - because my buyer simply trusts me
      - because my buyers doesn't care about auditing me
    - The buyer requests documentation (on health practices etc.)
      - No __
      - Yes, he requests:
        - Verbal documentation __
        - Written documentation __
        - On-farm inspection

11. What percentage of your net income from farming comes from your beef enterprise?
    - ➢ Less than 25% of my net income from farming comes from beef
    - ➢ Less than 50% of my net income from farming comes from beef
    - ➢ More than 50% of my net income from farming comes from beef

12. Please consider the following statements regarding two performance measures for your beef operation, net income and value of cow herd wintered. Considering my expectation (average) for these measures in 2007,

    - I think it is extremely unlikely that my net income in 2007 will be __ % **above** my **average net income**
    - I think it is extremely unlikely that my net income in 2007 will be __ % **below** my **average net income**

    - I think it is extremely unlikely that the value of my cows wintered in 2007 will be __ % **above** the **average value** of cows wintered.
    - I think it is extremely unlikely that the value of my cows wintered in 2007 will be __ % **below** the **average value** of cows wintered.

13. Considering all your farm activities outside of your cow-calf operation, could you please rank them in order of financial contribution to your overall farm income (1 being the most important activity):
    - ➢ Grain & oilseeds ___
    - ➢ Pork ___
    - ➢ Dairy ___
    - ➢ Sheep ___
    - ➢ Horses ___
    - ➢ Diversified livestock __
    - ➢ Other: ……………..

14. Are you or your family partner employed off the farm?
1. Myself: __ yes __ no
2. Partner: __ yes __ no

15. If you or your family partner work off the farm, do you work full or part-time?
1. Myself: __ full-time __ part-time
2. Partner: __ full-time __ part-time

16. If you or your partner work off the farm, your total off-farm income is:
    - ➢ Less than 25% of your farm income
    - ➢ Less than 50% of your farm income
    - ➢ More than 50% of your farm income

17. Please indicate your age

- ➢ Under 30 __
- ➢ 31-40 __
- ➢ 41-50 __
- ➢ 51-60 __
- ➢ 61 and older __

18. Please indicate your level of education

- ➢ High school __
- ➢ College __
- ➢ University __

Thank you for completing this survey! If you have further comments on the survey, or specific questions, please enter them in the following box: